JAN 26 1924

VOL. XX NO. 1

U. S. Bureau of medicine + surgery.

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY

THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

JANUARY, 1924
(MONTHLY)



Compiled and published under authority of Naval Appropriation Act for 1924, approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1923

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NAVY DEPARTMENT,
Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume VII, No. 2, April, 1913.
Volume VIII, No. 1, January, 1914.
Volume VIII, No. 3, July, 1914.
Volume VIII, No. 4, October, 1914.
Volume X, No. 1, January, 1916.
Volume XI, No. 1, January, 1917.
Volume XI, No. 3, July, 1917.
Volume XI, No. 4, October, 1917.
Volume XII, No. 1, January, 1918.
Volume XII, No. 3, July, 1918.

SUBSCRIPTION PRICE OF THE BULLETIN.

Subscriptions should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C.

Yearly subscription beginning January 1, $1.50; for foreign subscription add $1.00 for postage.

Single numbers, domestic, 15 cents; foreign, 24 cents, which includes foreign postage.

Exchange of publications will be extended to medical and scientific organizations, societies, laboratories, and journals. Communications on this subject should be addressed to the Surgeon General, United States Navy, Washington, D. C.

TABLE OF CONTENTS.

Page.

PREFACE V

NOTICE TO SERVICE CONTRIBUTORS VI

SPECIAL ARTICLES:

CLIMATIC BUBO.

By Commander C. S. Butler, Medical Corps, U. S. Navy 1

NOTES ON 350 APPENDECTOMIES.

By Lieut. Commander Lucius W. Johnson, Medical Corps, U. S. Navy 7

CLINICAL TRIAL OF THE ELLIS TEST FOR TUBERCULOSIS.

By Lieut. D. Ferguson, Medical Corps, U. S. Navy 17

CANCER IN ST. CROIX, VIRGIN ISLANDS.

By Lieut. C. B. Van Gaasbeek, Medical Corps, U. S. Navy 31

SUGAR IN URINE.

Lieut. Commander C. W. O. Bunker, Medical Corps, U. S. Navy, and Pharmacist's Mate R. L. Thrasher, first class, U. S. Navy 35

CLINICAL NOTES:

ENDOTHELIOMA.

By Lieut. L. H. Williams, Medical Corps, U. S. Navy 39

GLANDERS IN MAN.

By Lieut. L. H. Williams and Lieut. R. C. Satterlee, Medical Corps, U. S. Navy 41

ACUTE APPENDICITIS WITHIN A HERNIA SAC.

By Lieut. C. B. Van Gaasbeek, Medical Corps, U. S. Navy 43

CHANCRE OF THE PALMAR SURFACE OF THE HAND.

By Lieut. (J. G.) J. E. Root, jr., Medical Corps, U. S. Navy 44

RECURRENT DIFFUSE SCLERODERMA, A CASE OF.

By Lieut. C. W. Lane, Medical Corps, U. S. Navy 45

ACUTE YELLOW ATROPHY OF LIVER, A CASE OF.

By Lieut. G. L. McClintock, Medical Corps, U. S. Navy 49

NOTES AND COMMENTS:

Meeting of the Association of Military Surgeons.—Protection of capital ships against poison gas.—Thomas Wakley and the Lancet.—Diathermy in pneumonia.—Prophylactic injection of normal serum against measles.—Lamblial dysentery treated with carbon tetrachloride.—Endocrine survey 53

NAVY NURSE CORPS 75

INSTRUCTIONS TO MEDICAL OFFICERS:

Shortage in petty-officer ratings in Hospital Corps.—Hæmostatic forceps and surgical needles carried in stock at the medical supply depot.—Form N. M. S. F. (revised).—Policy of U. S. Employees' Compensation Commission regarding employees suffering from occupational diseases; now considered compensable and entitled to treatment.—Hospital accounting.—Examination report, Hospital

INSTRUCTIONS TO MEDICAL OFFICERS—Continued. Page.
Corps, U. S. Navy; Form N. M. S. H. C. 1.—Analysis of the naval hospital ration for 1923 (continental hospitals only).—Reprints of the bureau's circular letters for office files.—Additional data required on the Form F card in all cases of injury.—Health records retained in files.—Wampoles hypno-bromic compound.—Wampoles hypno-bromic compound, analysis requested 81
BOOK NOTICES 103
PREVENTIVE MEDICINE, STATISTICS:
PNEUMONIA, BRONCHITIS, AND TONSILLITIS SEASON. HOUSING, VENTILATION, AND CONTACT.
By Lieut. Commander J. R. Phelps, Medical Corps, U. S. Navy.. 107
Mass immunity to diseases.—Human intestinal parasites in Guam.—Prevention of venereal disease in England.—Vital statistics 127

PREFACE.

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form, such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX. JANUARY, 1924. No. 1.

SPECIAL ARTICLES.

CLIMATIC BUBO.

By C. S. BUTLER, Commander, Medical Corps, United States Navy.

Definition.—An adenitis affecting the lymph nodes of the groin and characterized by prolonged course, slight fever, and a tendency to necrosis on the part of the nodes involved.

Synonyms.—Tropical bubo; nonvenereal bubo; adenitis tropicalis; Klimatische Bubonen (Ger.); les bubons climatériques (Fr.); buboné climatica (Ital.); bubo climatica (Span.).

Etiology.—Though natives are affected, the condition is much more common among white people, and among men it occurs much more frequently than among women; in fact, it is rarely seen in the latter. This prevalence of climatic bubo among white men and its absence among white women in the tropics lends support to the prevailing idea that the disease is venereal in origin. In nearly all cases of climatic bubo there is a history of a recent immoral contact, and generally this has taken place with a native woman. When we eliminate the usual causes of inguinal bubo, such as gonorrhea, chancroid, syphilis, and sepsis, not to mention plague, septic absorption from sores on the feet, from wounds and from mycotic affections of the feet and crotch, from filarial disease and from trypanosomiasis, there still remains a group of inguinal bubos for which physicians practicing in the tropics are unable to assign a distinct cause, though it is evident that the condition is due to a living germ of some sort. We are unable to say, then, whether tropical bubo is a distinct disease or whether it is one of the usual agencies acting in an unusual way.

The disease has its greatest incidence among white soldiers and sailors serving in the hot, humid conditions which prevail in many parts of the tropical world. It is not, however, confined to the Tropics, as is shown by Inspector General Godding's figures for the British Navy and by Scheube for Kioto, Japan (35° N). In the United States Navy there are cases of apparently nonvenereal inguinal bubo which occur in northern climates. These cases are

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

increased in incidence for ships stationed in the Tropics and for the personnel of many tropical shore stations. Heiner (Nav. Med. Bulletin, 1913, p. 126) published 18 cases of climatic bubo, in all of which a sexual exposure had occurred (usually about three weeks previously). In 13 of these cases smears from the excised glands showed the presence of organisms resembling gonococci. In this connection it may be stated as immunologically conceivable that, with a uretha locally immune from a former gonorrhea, a gonorrhœal lymphangitis eventuating in an inguinal adenitis might occur from inoculation with a new strain of gonococcus which would produce little or no urethritis. Again the bacillus of Ducrey might conceivably gain entrance to the lymphatics and cause adenitis, the portal of entry having healed without being noticed. In each of these hypothetical cases, culture of the material from the bubo upon the *ordinary* culture media of the laboratory would give negative results. Nearly all investigators have reported the primary culture of tropical bubo material as negative. The majority of naval medical officers who have seen this so-called climatic bubo are firm in the belief that it is usually venereal in origin, though they are unable to explain how the virus gets to the inguinal lymph nodes without leaving some local evidence of its point of entry. We know, however, that adenitis, other than inguinal adenitis, *does* occur, and that it is often impossible to find the point of entry of the infecting germ. Thus, in plague, the first evidence of infection may be the bubo and there may be no lymphangitis in the area drained by the node involved nor any papule or vesicle indicating the probable point of entry of the bacillus. It may be well to mention here that *B. pestis* has been thought to be the cause of climatic bubo. Cantlie was formerly of this opinion. Other authorities have attributed climatic bubo to malaria. Each of these views is erroneous, and it may be positively stated that neither plague nor malaria has anything to do with the cause of the condition we are speaking about. Twenty years ago Scheube wrote "The question of the cause of climatic bubos, according to the material at present obtainable, is impossible to answer, and its explanation must be left for reply to future investigation. Only this much may be said, that the affection is caused by some still unknown factor that has undoubtedly some connection with the climate." At present, the status of the etiology of climatic bubo is substantially as he gave it for the year 1903.

Pathology.—The inguinal or the femoral glands on one or both sides may be involved. Usually the glands above Poupart's ligament are the ones affected, unilaterally as a rule, but occasionally on both sides. One or several nodes may be enlarged, and, in the latter case,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

one of the series may become much larger than the others. After subsidence of the adenitis, there may be relapse on the same side or the process may occur on the other side, leaving the nodes first involved alone. The size of the inflamed nodes varies from that of a filbert to that of a hen's egg. The nodes are congested, edematous, and may soften and give a sense of fluctuation. Often the reaction extends to the capsule and causes a periadenitis. Culture of material taken by gland puncture is usually negative, as stated above, when ordinary culture materials are used. We are not aware of any special methods or media having been employed in the study of this condition. If cultures in the early cases are positive, the organisms usually recovered are staphylococci. When the bubos have been suppurated, as occurs in about 40 per cent of the cases, or when the glands have been dissected out, of course we get the ordinary pus organisms in our cultures. Letulle and Nattan-Larrier (Bull. de la Soc. de Path. exot., v. 3, 1910, p. 758) describe the histologic changes in climatic bubo as:

1. Dislocation of the glandular tissue.
2. Plasma cell infiltration, diffuse and patchy.
3. Insular necrosis of the reticular tissue of the gland. They were unable to stain any bacteria in the single node which they studied.

As regards the leucocyte reaction in climatic bubo, it seems that in the early stage of the condition there is a slight leucocytosis. Not all cases, however, give this. Counts vary from normal to 25,000 and over per cubic millimeter. As a general thing the leucocytosis is between 10 and 20 thousand. Certain authors, as, for instance, Clayton (Jn. Trop. Med. Jan. 2, 1905) and Phillips (Nav. Med. Bul., July, 1912), have called attention to what would seem to be a rather constant eosinophilia in climatic bubo In their cases apparently they excluded the things which ordinarily give an eosinophilia, such as intestinal parasites. One of Clayton's cases showed as high as 22 per cent of eosinophiles. Another case showed 8 per cent of eosinophiles, while in both of Phillips's cases the percentage of eosinophiles was around 8. Phillips suggested that climatic bubo might be due to some protozoan on account of the eosinophilia. This probably has no etiological significance. It may, however, be of some diagnostic significance, in that plague, with which climatic bubo may be confused, has no eosinophilia. In the case of plague, however, the leucocyte counts are very much greater. Climatic bubo, if the gland suppurates, gives a polyneucleosis as does any other abscess. One of Clayton's cases gave the following white counts on different days of the disease: November 24, 11,200; December 12, 18,200; January 4, 10,000; and February 15, 45,000. On the whole, there isn't much

Digitized by Google Original from UNIVERSITY OF MICHIGAN

that we can say about blood counts in climatic bubo except that there seems to be primarily in most cases a slight leucocytosis.

Symptomatology.—The period of incubation of climatic bubo is approximately three weeks. As regards its symptomatology, fever (slight) usually remittant in type, occurs in the majority of cases. Malaise and some pain in the region of the affected gland is almost constantly noted. Glands vary in size from a filbert to a hen's egg and often give the impression of fluctuation. If the disease lasts for 4 to 6 weeks there is usually some anemia developed. At times the disease runs the course without fever. At other times the febrile reaction seems to precede the enlargement of the lymph nodes. The course of the disease is from 10 days to 4 to 5 months. Chilly sensations and pain in the back and legs are occasionally complained of when the disease begins. Some authors have described a general adenopathy accompanying the inguinal enlargement. In the writer's experience this is unusual.

Diagnosis—Conditions from which climatic bubo are to be differentiated are mild forms of plague in regions where plague occurs; from venereal bubos where the venereal evidence is slight; from Hodgkin's disease showing primary inguinal involvement. Usually the diagnosis is easily made. In case of plague, while about 70 per cent of plague bubos are inguinal, the other symptoms are more marked and graver than in the case of climatic bubo. The leucocytosis, the greater tenderness of the bubo, and the mental condition of the patient should serve to differentiate. Gland puncture and laboratory study, will demonstrate *B. pestis.* As regards the differentiation from Hodgkin's disease, it is not usual for the primary enlargement of the lymph nodes in Hodgkin's disease to be inguinal. The blood picture is different; and though there may be periods of fever in Hodgkin's disease, the course of this disease is quite different from that of climatic bubo, and there is no tendency on the part of the glands to undergo necrosis in pseudoleukaemia.

Prognosis.—Thirty-six cases of climatic bubo published by Ruge showed 60.5 per cent of the swellings absorbed, notwithstanding their size, without operation, while 39.5 per cent had to be operated upon. Climatic bubo appears not to be primarily dangerous to life. Secondary infections, however, may cause the death of the patient.

Treatment.—The treatment of climatic bubo deserves considerable study. From the figures published above—that is, that 60 per cent of these swellings may be absorbed without operation—it is evident that the expectant treatment has considerable to be said in its favor. The shortening of the course of the disease and getting the patient off the sick list are not necessarily the main considerations. If by the expectant treatment we can obtain the cure of more than half

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the cases and at the same time leave the lymphatic structures intact it would certainly seem worth while to try this treatment out. Once the glands have been dissected out they can not be replaced, but nature's repair to the nodes, as is often effected if she is given a chance, probably leaves a large part of the gland structure and gland connections in as good condition as before. To this end the patient should be put to bed and ichthyol applied on gauze by means of a firm bandage. If the glands suppurate it is probable that the next best treatment is to open up only those nodes that are broken down. This radical treatment consists in dissecting out all of the diseased glands and closing the wound thus made in the hope that it will heal with the least possible loss of tissue. There is little doubt that this radical operation shortens the course of the disease considerably. There is grave doubt, however, as intimated above, that it is best in the long run.

Internal medication by salicylates, quinine, and the usual array of "specifics" is useless. Rest, laxatives, and tonic are the general measures indicated.

The author of this paper submitted it to Capt. Raymond Spear, Medical Corps, United States Navy, and to Lieut. Commander J. R. Phelps, Medical Corps, United States Navy, for comment.

Comments by Capt. Raymond Spear.—"In my experience with climatic bubos, I do not believe 60 per cent of real tropical bubos recover without operation. One point in tropical bubo I think you have not mentioned, is the involvement of the skin. Personally I believe if the glands are much involved and the skin is red and the patient is running a temperature, the quicker the glands are removed the better. It is really wonderful how a man who is suffering from absorption from the infected glands and who has been in bed two or three weeks, or possibly longer, will recover when the diseased tissues are removed. From this point alone it looks to me as if the disease were entirely a local one. Many times it is of course difficult to diagnose these cases before operation, but at the operation the appearance of the glands in tropical bubos is typical. They resemble tonsils involved in an acute follicular tonsillitis.

"The operation of choice, to my mind, is to make a clean dissection of the glands with the idea of removing all the overlying skin and not to make any attempt at sewing the wound up. In a series of about 10 cases that I operated on while in Guantanamo, Cuba, the cases having originated in Haiti, I did this operation and shortened the convalescence, I am sure, by exposing the wounds directly to the air and sunlight and protecting them by a wire-mesh guard which was held in place by a strap around the waist and one around the thigh."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Comments by Lieut. Commander J. R. Phelps.—"The United States Navy Nomenclature of Diseases and Injuries at present contains no diagnostic title intended specially to cover so-called climatic or tropical bubo The general title, "Lymphadenitis, acute, Class XIV, Diseases of the lymphatic system," is the only term now available for cases which after careful consideration appears to belong in such a group.

"In the last analysis, the validity of morbidity statistics depends upon the judgment of the medical officer who returns the case morbidity report. He is the one who sees the patient, studies the case, and makes the diagnosis. The nomenclature is but an alphabetical list of approved names and approved spelling. The case occurs and a diagnostic title must be selected. If there is not a special term available that will accurately describe the case and differentiate it from all or many other conditions, the medical officer must choose the diagnostic title that best serves the purpose.

"The inclusion of the nomenclature of such a term as climatic bubo has been regarded as objectionable by the Bureau of Medicine and Surgery on the ground that a high percentage of erroneous diagnoses would contribute to make the figures for the title inconclusive or without value. It all goes back to the care exercised by each medical officer concerned and the accuracy of his observations. These cases at present are returned for the most part under the diagnosis, acute lymphadenitis, without specification as to anatomical location. Obviously no conclusions of epidemiological importance can be drawn from the figures under such classification. Consequently, the question of classification is of secondary importance in this instance, there being no class specifically representing either a pathological or epidemiological entity to protect from the statistical standpoint.

"Therefore, the title, 'Inguinal bubo, nonvenereal,' has been included in the revised edition of the Nomenclature, which, it is hoped, will be ready for adoption before the new year. But it will not be wise to take figures compiled from reports returned under this heading at their face value. Doubtless, some cases that are really venereal in origin will be included either because of the lack of evidence of venereal infection altogether or because the infected individual is given the benefit of the doubt. The term will be used for all infections regarded as nonvenereal in origin; not simply for idiopathic cases or those regarded as due to the often indeterminate influence of climate or geographical location. It is not considered practicable for statistical purposes to provide a more specific term. Until climatic bubo has been placed upon a more exact clinical basis through experimental studies or epidemiological investigation, statistical studies can not be relied upon for additional direct information."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

NOTES ON 350 APPENDECTOMIES.

By L. W. JOHNSON, Lieutenant Commander, Medical Corps, United States Navy.

It is customary to begin an article on appendicitis with an apology for writing anything further on a subject about which everything worth while has already been written. Such an apology would be appropriate if all cases of the disease were alike; but its most striking feature, and the one which justifies articles on the subject, is its protean nature, its tendency to disguise itself as something else. This is evident not only in the operating room and the ward but also in the literature, where surgeons of equally great experience will be found to hold radically different views as to the causes and symptoms of appendicitis.

No effort will be made in these random notes to cover the field of diagnosis or treatment in a systematic manner. I desire merely to discuss certain points which have proved useful or interesting to us in our work. The operations were done in naval hospitals, hospital ships, and other naval vessels, as well as a few in civil hospitals. With a few exceptions, the patients were men or officers of the Navy, a group from which the physically unfit are supposedly excluded, so it may be expected that our statistics will be somewhat different from those whose patients include all classes of people.

SYMPTOMS.

Fever.—Morison says (Lancet, Vol. CCIII, No. 5167, September, 1922, p. 553): "It is probably true to say that sudden, severe abdominal pain attended by a rise in temperature means mischief in the appendix." This is true when fever is present, but in an equally great number of cases there is no rise in temperature during the first 24 hours, when diagnosis is most difficult and most important. If the fever goes above 102° during this period, one should search carefully for other infections which may be present either with or without appendicitis. In this series more than one-half of the acute cases had no rise of temperature up to the time of operation. Most of these were mild, but several were very severe, obstructive, or gangrenous. Most of the acute cases with fever had temperatures between 100° and 102°. Those with temperatures above 102° were all found to have abscess, general peritonitis, or some complicating condition, usually in the lungs, which would account for the high fever. Abscence of fever means little, but if present it suggests to some extent the pathology that is present.

Pulse rate.—In the early stages of the disease the pulse rate offers little help in diagnosis or prognosis. It is seldom above 100 unless there is gangrene, obstruction of the lumen of the appendix, or a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

complicating infection, such as bronchitis. The very rapid pulse belongs to the later stages and is the result of complications or extension of the disease. Frequently there is no increase in the rate, and even very severe cases with rupture or peritonitis are seen with the pulse rate remaining normal. In the early stages of the disease the pulse rate is more constantly affected by the severity of the pain than by any other factor.

Nausea or vomiting.—This is one of the early and constant symptoms of the disease, usually appearing within three or four hours after the initial pain. The vomiting is usually not marked or persistent, though nausea may continue. Persistent, severe vomiting is due to some complication. We have very frequently observed that vomiting is a much more prominent symptom in cases of obstructive appendicitis with pus under pressure distal to an obstruction of the lumen. While nausea and vomiting are very constant as a symptom, we had 3 cases of severe, fulminating, gangrenous appendicitis in which this symptom was absent. If there is any rule which is universally true in appendicitis, it is that if the vomiting appears before the pain it is not appendicitis. Next to the pain, nausea or vomiting is the most constant and reliable symptom.

Leukocyte Count.—Many of the operations were done in such places or under such conditions that no reliable blood counts were recorded, but in 131 of the acute cases this was noted. The absolute leukocyte counts were distributed as follows:

	Per cent.
Group 1 (8,000 or below)	5.3
Group 2 (8,000 to 15,000)	41.2
Group 3 (15,000 to 20,000)	36.6
Group 4 (20,000 or over)	16.8

In groups all cases were mild; none had pus under tension in the appendix. One case, with 7,500 leukocytes and 47 per cent polynuclears, had no appendicitis, but hyperplastic tuberculosis of the lower ileum. In group 2, all were acute, severe appendicitis with distinct gross pathology. All recovered except one (No. 348) which reached the hospital on the 11th day of the disease and died 16 days later. Eighteen per cent of these cases had pus under tension in the appendix and 14 per cent were found to be ruptured. In group 3, about 60 per cent had pus under tension in the appendix; 20 per cent had ruptured; 12 per cent had infections in other organs which probably affected the white cell count. All had acute, severe appendicitis. One died of streptococcus septicemia. In group 4, 80 per cent had gangrenous or ruptured appendices and 20 per cent had acute appendicitis with bronchitis as a complication.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The differential count is of greater value. The rules laid down by Hewitt (Ann. Surg., 1917, Vol. LXVI, p. 143) cover this very well:

"First, the absolute count, when taken alone, is of questionable value.

"Second, the polynuclear count alone is, in the great majority of instances, a reliable index in diagnosis.

"Third, the correlated absolute and polynuclear counts are of greater value than either count taken alone, especially as regards prognosis.

"A high absolute count with a high polynuclear count means usually a good prognosis (e. g., absolute, 35,000; polynuclear, 95 per cent). A high absolute count with a moderately low polynuclear (e. g., absolute, 30,000, polynuclear, 80 per cent) means usually a very good prognosis. A low absolute count with a high polynuclear count (e. g., absolute, 7,000, with polynuclear 95 per cent) indicates a grave prognosis (speaking generally). A low absolute count with a low polynuclear count means (e. g., absolute, 7,000, with polynuclear 65 per cent) usually no infection, or that the acute condition is due to anatomical or mechanical causes; in other words, that the infection, if one be present, has not stimulated the resisting powers of the body sufficiently to produce a leukocytosis.

"Fourth, normal or subnormal figures do not necessarily indicate the absence of suppuration, gangrene, or their sequels.

"Fifth, catarrhal cases, fulminating cases, moribund cases, and walled-off abscesses frequently do not stimulate leukocytosis."

At the San Francisco session of the American Medical Association in June, 1923, Ochsner said (Journ. Amer. Med. Assoc., vol, 81, No. 8, Aug. 25, 1923, p. 631): "A leukocyte count is invariably made—and never looked at until after the operation has been completed. It is not well to cloud one's judgment by paying attention to it beforehand. * * * The plan followed by many surgeons of always operating immediately in case of a high leukocyte count or a rising count is bad practice because the judgment is then controlled by a minor factor, which is inconstant and unreliable, instead of being based on history and physical examination." Other surgeons present took exception to this, saying that the leukocyte count was valuable in diagnosis and in indicating the treatment, especially in children where the high count suggests pneumonia rather than appendicitis.

In our cases the white-cell count proved of considerable value. Those with a count of 8,000 or below were all mild. Those above 15,000 were more serious than those below that figure, and those above 20,000 were all gangrenous, ruptured, or had bronchitis as a complication.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Chronic Appendicitis.—At the present time this occupies a much larger place in medical literature than does the acute condition. This is largely due to the fact that a very great number of operations for chronic appendicitis do not relieve the symptoms. Since this lesion may mimic disease of any organ of the abdomen, including the urinary organs, and since lesions of many organs may cause pain in the right iliac region, chronic appendicitis must be considered as a possibility in nearly every case of chronic abdominal distress. There is a strong tendency to blame the appendix for every case of chronic indigestion in which the diagnosis is difficult. This is largely because we know of a definite thing to do for that condition—remove the appendix. The danger of making this quick and easy diagnosis before eliminating all the other possibilities is shown by the frequency of postoperative persistence of symptoms.

The following rules have proved very useful to me in diagnosis: (*a*) Most cases of chronic appendicitis follow acute attacks which have recovered without operation. It is stated that there is no chronic appendicitis without a previous, definite, acute attack. Hence a careful history is important. (*b*) While pain in the right iliac region is the most important single symptom, if pain is limited entirely to this region it is probably not chronic appendicitis. (*c*) Practically every case of chronic appendicitis gives a history of pain and digestive disturbance. The more difficult it is to determine the cause of chronic indigestion, the more likely it is to be the appendix.

It has been our custom, whenever possible, to study our interval or chronic cases thoroughly before operation, by gastric analysis, X ray and opaque meal, urethral catheterization, pyelography, or other suitable means. When they come to operation a large rectus incision is usually made in order to explore the gall bladder, pylorus, and other organs. The X ray has been of the greatest help by showing abnormalities of the stomach, gall bladder, pylorus, or kidney. Assuming that the normal appendix fills and empties about twice per hour while the cecum is full, prolonged retention or absence of the opaque material from the appendix suggests an abnormal condition. Excessive mobility or fixation of the cecum can often be demonstrated by the X ray and may cause symptoms resembling chronic appendicitis. In several cases where there was no appendiceal shadow and the symptoms approached a definite neurosis the appendix was found to be of the obliterative type.

Bastedo's test for chronic appendicitis is made by passing a tube about 10 inches into the rectum and injecting air by means of a bulb. As the air pressure increases, the pain and tenderness are greatest near McBurney's point if there is chronic appendicitis. Several surgeons have written in praise of the test, while others have not

Digitized by Google Original from UNIVERSITY OF MICHIGAN

found it reliable. Rosenbloom (Surg., Gyn. and Obstet., November, 1916, p. 538) found the test positive in each of 14 cases of chronic appendicitis and negative in each of 26 cases not having this condition. We tried this test in 22 cases of suspected chronic appendicitis, but the results were so inconstant and so difficult to interpret that we found it of little value. It was present in several cases where there were dense adhesions or a heavy veil about the appendix.

OPERATION.

Choice of Operation.—The McBurney gridiron incision was used in 66.8 per cent of the cases, a rectus incision in 22 per cent, a low midline incision in 1.5 per cent, and 9.7 per cent were removed through a herniotomy incision. It has been our custom, in males, to use the McBurney incision in all acute cases where the presence of rupture or abscess is suspected. For interval and chronic cases we use the rectus incision and examine the gall bladder, pylorus, and other organs that may be involved. We customarily remove the appendix in any laparotomy unless there is some good reason for leaving it. The advantages of using the McBurney incision when pus is present are many. It gives quick and easy access to the appendix without soiling other peritoneal areas. All manipulations are done in the safe region to the outer side of the cecum and one can avoid spreading infection to the dangerous region median to the cecum. Drainage through the operative wound or by a stab wound in the flank is easily arranged through the gridiron incision.

Two-stage operation.—There are certain cases where, after the peritoneum is opened, it is seen to be inadvisable to remove the appendix during the acute stage. When rupture has occurred, resulting in a walled-off abscess and removal of the appendix involves breaking down the wall; when free pus is found and the appendix can not be removed without much manipulation and soiling of new areas, then it is best to drain and get out as quickly as possible. When the appendix has ruptured it has already done the worst of which it is capable, but the surgeon who takes pride in fetching home an appendix every time he goes after one may greatly increase the damage by spreading the infection with his meddlesome fingers. Treves is quoted as saying, "When you strike pus, quit," and if one follows this rule he will save a greater number of his desperate cases. Local anesthesia or nitrous oxid may be used in these operations if the condition is known in advance, and the drain should be inserted as quickly as possible, with the least handling of the intraperitoneal tissues.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

In this series there were nine such cases, in which rupture had occurred, pus was present, and the appendix could not be removed without manipulation. Each was drained and returned as quickly as possible to the ward, where Crile's method of treatment was followed. All of them were desperate cases; three of them died. Appendectomy was later done in five of the survivors.

When operating to remove the appendix after rupture it will frequently be found to have amputated itself. This condition was found in three cases, the appendix in one case (No. 607) being found attached to the omentum 5 inches away from the cecum, which showed a scar where the appendix had sloughed off. A large concretion was still present in the lumen and a new blood supply had been established from the adjacent tissues. Such an occurrence might account for some of the cases in which no appendix is found at operation.

Adhesions will be found to vary greatly after rupture and purulent peritonitis. Some cases operated a month after rupture will be found entirely free from adhesions, while others, after the same interval, will have very dense adhesions.

Routine removal.—In 52 cases the appendix was removed as a routine measure in the course of laparotomy for other conditions. Thirty of these showed gross pathology; 22 were considered normal; 14 contained concretions. The appendix is usually removed in right side hernias if it is found in the sac or can be brought down without difficulty. In 28 cases it was so removed, being found in the sac three times. Fourteen of these appendices showed no gross pathology; eight contained concretions; four showed chronic inflammation; one was surrounded by a heavy veil; and one was of the obliterative type. Eleven were removed during gastroenterostomies for peptic ulcer and all showed gross pathology. Five contained concretions; four had heavy veils two were chronically inflamed and adherent. Eight were removed during cholecystectomies and only one appeared normal. Four had concretions and were chronically inflamed; two were acutely inflamed; one was kinked within a heavy veil. It is interesting to note that of the nineteen removed from patients with cholecystitis and peptic ulcer, all but one showed gross lesions. Four appendices were removed during gynecological operations and one during operation for acute intestinal obstruction. All of these appeared normal.

Drainage.—When to drain, by what route, and what materials to use as drains are subjects on which surgeons differ widely. As one's experience increases, fewer and fewer cases are drained. A good rule is, when in doubt, do not drain. Blake (Ann. Surg., Vol.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

LXXV, No. 4, April, 1922, p. 385) says that drains into the peritoneal cavity are unnecessary when, after elimination of the cause of the peritonitis, there is no great difference in the appearance of one part of the peritoneum from another. In other words, a diffuse peritonitis, no matter how bad, does not require drainage, but a localized peritonitis or abscess should be drained. A necrotic or gangrenous appendix does not require drainage if all of the necrotic tissue is removed.

The resistance of the peritoneum to infection is very much greater than that of the tissues of the abdominal wall. When the tissues have been soiled during removal of the appendix it is safe to close the peritoneum and leave a drain down to it. A mural abscess may develop, but I have never seen peritonitis develop in such a case. A rubber band, size 32, is suitable for such a drain. If infection develops it makes a hole large enough to insert a small Carrell tube, and if there is no infection it can be removed in 24 to 48 hours without interfering with the healing of the wound. Turbid fluid or plastic exudate is not sufficient reason for drainage. When a walled-off abscess is found within the peritoneum the Carrell-Dakin method, properly applied, will clean it up much more quickly than any other method I have seen. When the abscess is superficial to the peritoneum, in the tissues of the wall, this method is even more valuable because of its ability to dissolve necrotic tissue and remove the sloughing aponeurosis which usually delays the healing process. This property of dissolving necrotic tissue belongs to Dakin's sodium hypochlorite solution and not to chlorazene.

Drainage by a stab wound through the flank is of value in large abscesses, as it allows fluids to escape by gravity. For drainage through the anterior abdominal wall it is better to use a stab wound than to pass the drain through the operative incision, because the extension of infection along the muscle planes and resulting damage to the wall are much less by the former method.

How long shall drainage be continued? Opinions and customs vary widely in this. I have seen much damage done by drains being left in too long, but none by removing them too early. Twenty-four to forty-eight hours is long enough for the drain to remain within the peritoneal cavity. If the patient has defensive reaction enough to recover from his infection, the tube will be thoroughly walled off within 48 hours and any further fluid which may appear will be poured out in an effort to float away the irritating drain. The drain through the muscle layers, down to the peritoneum, is a different thing, for the contraction of the muscles constantly tends to close the opening, and here the drains will be required for a longer time. When it is probable that an infection

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of the wall will develop it is well to place the tubes at the time of the operation so that injections of Dakin's fluid can be started without delay. In nearly every case where drainage is found necessary, the Carrell-Dakin treatment can be used to advantage. Several times, when we have found walled-off abscesses within the peritoneum, we have aspirated the pus, filled the cavity with 2 per cent solution of mercurochrome—220, and closed the peritoneum without drainage. Whether or not the drug made any difference in the recovery is a hard question to answer.

In this series of cases, 29 (8.2 per cent) were drained. At least 9 of the earlier cases would not have been drained if my experience had been greater at that time. Soft rubber drainage tubes were used and removed in 24 to 48 hours.

Burying the Stump.—The stump of the appendix was buried, inverted, or otherwise given special attention, in 231 cases (66 per cent). It was done in most of the earlier cases and in few of the later ones. Training of younger surgeons is one of the most important features of our work, and the desire to give them practice in intestinal sewing usually furnished the motive when the stump was buried. We were unable to observe anything in the convalescence or later history of any of the patients in whom this step was omitted that would lead us to believe that it made any difference to the patient whether or not the stump was buried. Many cases are met in which it greatly increases the difficulty and length of the operation. Extensive adhesions, extreme friability, and induration of a large area of the cecum about the base of the appendix frequently make it inadvisable to bury the stump.

GROSS PATHOLOGY.

Concretions.—These were noted in 135 cases (38.6 per cent). Many times they evidently played a large part in the etiology, and they must always be considered as dangerous. The frequent presence of concretions in appendices which were kinked or distorted by adhesions or veils was very impressive, and those conditions which interfere with the normal filling and emptying of the organ evidently have something to do with the formation of fecaliths. Ulcers are frequently seen in contact with concretions. Recently I have seen 37 cases of acute appendicitis in which the lumen was blocked by a concretion and fluid was under pressure in the distal portion. In 7 cases concretions were found free in the peritoneal cavity after rupture of the appendix. Gangrene in an inflamed appendix is frequently seen to be beginning at the site of a concretion.

Appendiceal Obstruction.—Dieulafoy maintained (Progès Médicale, No. 11, 1896) that appendicitis is *always* due to conversion of the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

appendix into a closed cavity. This may be due to concretions, fibrous stricture, kinks, or other causes. Pitzman (Ann. Surg., Feb. 1920, p. 149) contends that there is " no surgical appendicitis without organic stricture," and submits much evidence, both clinical and pathological, in support of this belief. He calls attention to the frequency with which fluid under tension is found in the appendix distal to a stricture which was evidently pervious until just before the attack. Since reading Pitzman's article I have looked for this condition, and in 62.7 per cent of cases of acute appendicitis have found it to be present. Pitzman mentions only fibrous stricture as the cause of the obstruction, but in our cases 71.8 per cent was caused by concretions, 21.8 per cent by fibrous stricture, and the remainder by kinks. It is quite possible that in those cases where a calculus was the obvious obstructing agent a fibrous stricture was also concerned, the calculus being dislodged from its usual position and forced against the stricture so as to block it. Cases are frequently seen with the lumen obstructed by a stone and the distal portion enormously distended and gangrenous, so that rupture is imminent. By pushing the concretion toward the tip and milking the pus past it into the cecum the pressure can be relieved and the danger of rupture lessened. Pitzman also calls attention to the difference in symptoms in those cases having a definite stricture and those which definitely have none, those with strictures having characteristic sharp attacks with much pain. I have frequently observed this and also that when colicky pain and vomiting (the principal symptoms of intestinal obstruction) are unusually prominent, there will be found an obstruction of the lumen of the appendix.

Behan, in a study of experimental appendicitis in rabbits, noted (Am. Jour. Med. Sci., vol. 162, No. 5, November, 1921, p. 705) that the only time acute inflammatory changes in the appendix occurred was when the lumen of the appendix was entirely obstructed. When the obstruction extended beyond the mucosa a very marked reactive inflammation resulted and gangrene of the appendix took place. The bacteria which normally are present in the appendix are harmless while all its tissues are healthy and the lumen is free; but when it is inflamed and the outlet obstructed they develop great virulence, like the gunpowder which burns harmlessly in the open air but develops tremendous force when confined in a closed space such as the chamber of a gun. Obstruction may not be always present, but undoubtedly it is a most important factor in the great majority of cases.

Abnormal positions.—In 87 cases (24.8 per cent) the appendix was found in an abnormal position. The retrocecal variety was most common, 58 being of this type. Six others reached to the mid line

Digitized by Google Original from UNIVERSITY OF MICHIGAN

posteriorly; 3 rested on the psoas muscle; 4 were found high up in the fetal position with incomplete rotation of the cecum; 3 were in the pelvis; 8 reached to the mid line anteriorly, and 3 of these were adherent to the bladder; 3 were found in hernial sacs; 3 were found at a distance from the cecum, having sloughed off during a previous attack. These amputated remnants retained their characteristic structure and had acquired new blood supply in their new locations. One was attached to the parietal peritoneum near the sacroiliac joint; one to the posterior wall of the cecum 2 inches from its original attachment; the third was attached to the mesentery of the ileum 5 inches away from the cecum.

Unusual positions were frequently suggested by the symptoms. Several of those in the retrocecal fossa had pain in the flank suggestive of ureteral colic. Appendiceal pain when walking or jumping was noted in those which had the appendix resting on the psoas muscle. Bladder irritation was present in those having the appendix in contact with the bladder. It is an interesting game to prophesy from the signs and symptoms what will be the location of the appendix and its pathology. Once in a while a correct guess will be made.

When the appendix is in an abnormal position and hard to reach it will be made easier if a tape is passed through the mesenterium and used for traction. Then the appendix can not escape while the tip is being freed, and it saves much handling of the intestine. If the base is movable and the tip is fixed, it is well to cut off the appendix at the base, push the cecum away, and then work toward the tip. Many of the adherent, retrocecal appendices can be reached more easily by going posteriorly, outside the parietal peritoneum, as if for exposure of the ureter, and cutting through the peritoneum alongside the attachment of the cecum.

Complicating Conditions.—The following conditions were noted as being present before operation: Tonsillitis in 4 cases, epilepsy in 2, acute cholecystitis in 3, gastric ulcer in 8, and mastoiditis in 1. At operation heavy veils or dense adhesions were found in 53 cases (15.1 per cent) and persistent vitelline duct in one case. Postoperative complications were: Pulmonary tuberculosis, 8; intestinal obstruction, 3; pneumonia, 7; endocarditis, 2; measles, 1; pyelonephritis, 3; delirium tremens, 1; phlebitis of leg, 2. Bronchitis was a very frequent complication, especially while on the hospital ship. At certain seasons nearly every patient coming to us had bronchitis and the rest developed it after operation. Appendicitis following an acute tonsillitis was observed several times, and it was also noted that epidemics of food poisoning with intestinal toxemia usually produced a case or two of appendicitis.

It seems remarkable that the custom of giving a cathartic for pain in the belly is still so prevalent. Countless writers and speak-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ers have reiterated for years the warning that appendicitis must be excluded before it is safe to give a cathartic in such cases. Yet a great number of patients, on arrival at the hospital, state that they went to the sick bay with pain in the belly and the medical officer or corpsman gave them salts or castor oil without examining them. One gets the impression that this dangerous, if not criminal, catharsis is still regarded as the proper routine treatment of appendicitis.

A CLINICAL TRIAL OF THE ELLIS TEST FOR TUBERCULOSIS.

By DAVID FERGUSON, Lieutenant, Medical Corps, United States Navy.

INTRODUCTION.

The early diagnosis of pulmonary tuberculosis is a problem which has long confronted the medical profession.[1] Upon it is not only dependent the expectancy for an early and complete recovery, but also the prevention of infection in those with whom the tuberculous patient is in close contact.

It is a well-known clinical fact that early tuberculosis may be suspected from the presence of certain symptoms long before physical findings are demonstrable and also that the reverse may obtain. Too frequently the appearance of tubercle bacilli in the sputum may be greatly delayed.

The indeterminate clinical picture which incipient phthisis may present has stimulated search for useful diagnostic aids. In 1891 Koch demonstrated the difference in the reaction to tuberculin in healthy and tuberculous animals, and recommended the subcutaneous administration of tuberculin for diagnostic purposes. Calmette, Moro, and Mantoux developed the tests which bear their names. In 1907 Von Pirquet and Schick developed the cutaneous tuberculin test.

The Tuberculin Reaction.—The high degree of specificity of the tuberculin reaction is generally accepted. False positive reactions are obtained in leprosy, due to the biological similarity of the causative organism. They also occur in clinically healthy individuals having either a small hidden tuberculous lesion or a healed focus.

False negative reactions are usually found in (*a*) the terminal cachectic stages of tuberculosis and in fulminant miliary disease in which the patient is so saturated with the tubercle toxin produced by the disease that it can not react to further artificial amounts; (*b*) the early stages of infection in which insufficient antibody or hypersensitiveness has developed; (*c*) tuberculous individuals who have

[1] An excellent résumé of diagnostic methods and procedures was published in the Naval Medical Bulletin of June, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

only slight hypersensitiveness to tuberculin; (*d*) from trauma, attendant on the application of the various cutaneous tests, which may result in redness and swelling; (*e*) the nonspecific skin reaction to foreign proteid.

There has been much discussion concerning the mechanism of the tuberculin reaction.

Wassermann and Bruck accepted the antigen and antibody theory of Ehrlich. This explanation assumes that those cells at the periphery of the tuberculous focus were possessed of increased receptor for tubercle antigen. Because of this, tuberculin would be concentrated at these cells, the result being an increased activity of the lesion and accentuation of the systemic symptoms.

This theory does not explain the positive reactions occurring in those who have healed tuberculous lesions.

Zinsser regards the mechanism of the tuberculin reaction as a general tissue hypersusceptibility of the nature of anaphylaxis. Many vagaries of tuberculin tests may be explained on this assumption.

Von Pirquet found that an individual giving a negative test at first, on retesting in a few days may give a frank positive response. By using his left arm repeatedly for the tuberculin test, Von Pirquet could obtain a positive reaction with a tuberculin dilution of 1–1,000, whereas his infrequently used right arm gave a negative reaction to dilutions of 1–100.

Kohn showed that while the first instillation of tuberculin in the eye of a normal person gives no reaction, the eye will not only react positively to a second instillation but the same positive response is obtained if the second dose of tuberculin is given subcutaneously.

Kolmer believes that acquired hypersusceptibility is more analogous to true serum anaphylaxis than to toxin hypersusceptibility because tuberculin in itself is but slightly toxic.

The Limitations of the Von Pirquet Test.—Nageli and Burkhart's statistics show that the incidence of tuberculous infection increases with advancing years. Demonstrable tuberculous foci are present in 4 per cent of infants, 70 per cent of children under 14 years, and in 90 per cent of those over 18 years of age. As healed or quiescent foci will give, in the large majority of cases, a positive skin reaction, the usefulness of the Von Pirquet test is greatly limited. At present its value is largely confined to a negative reaction in an infant, which argues strongly against the probability of tubercular disease.

The Ellis Modification of the Von Pirquet Test.—In a recent survey of the European Clinics, Lieut. Commander W. A. Bloedorn, Medcial Corps, United States Navy, visited Ellis's clinic at London and was very favorably impressed by the thoroughness of the clinical, laboratory, and X-ray work carried on there.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Ellis developed a test for active tuberculosis a number of years ago, and in checking it with his clinical and laboratory staff he found it to be an accurate indicator in 90 per cent of cases.

I am indebted to Doctor Bloedorn for the following data on the Ellis test:

This test has been used by Ellis in a large number of cases, and he considers it of great help in the diagnosis and prognosis of pulmonary tuberculosis.

The original von Pirquet test, according to Ellis, was unreliable in that the papillary layer of the skin was not penetrated. Von Pirquet states specifically that in performing this test, blood should not be drawn. Ellis's investigations lead him to regard the papillary layer of the skin in which the smaller blood vessels run as the most keenly sensitive to tubercular reaction. He considers that the specific reaction which takes place in the deeper epithelial layer explains to a large extent the erratic results obtained by von Pirquet's superficial cutaneous method, as when the papillary layer was accidentally injured, much more definite results would be obtained than when it was uninjured.

The method of procedure and performing the test of Ellis is as follows:

Three dilutions of old tuberculin are used, namely, 1–10, 1–100 and 1–500, the diluent in each case being one-half of 1 per cent carbolic acid in normal saline. The skin of the flexor surface of the forearm is considered the best site for the test. A small drop of each dilution is placed on the forearm, commencing just below the elbow, about an inch apart. Then, using a lancet with a round, very sharp point, a few quick movements are made through the drop and the superficial layer of the epidermis, about one-quarter of an inch long. The blood does not often appear until after the scarification at one point has been finished. The lancet is wiped, and the same procedure is carried out in the control, which is made without tuberculin, making four in all. The essential points are that the bleeding layer must be penetrated, the scratch must be made through the solution, and the knife must be wiped so that no solution is carried over to the next dilution, and so vitiate the results. The lancet must be properly sharpened, and there must be at least five small scratches alongside each other at each dilution, or the result is unreliable.

The whole is then covered with a small absorbent pad which is retained in position for two days by strips of adhesive plaster around the arm.

The procedure causes little inconvenience or discomfort, and the whole process takes less than two minutes; there are no uncom-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

fortable after effects. It is wise to tell the patient that the procedure is performed for the doctor's information, and will not cause any general reactions.

At the end of the second day, the dressing is removed, and the reaction read. If the reaction is acute, the point of inoculation will be red and swollen. The next characteristic will be the disappearance of the cut marks in contrast with the control. The swelling may be quite considerable, and is best appreciated by running the finger over the skin. The color varies in two directions. The brighter it is, the more active and recent is the tubercular infection. When the swelling is considerable, the color is driven out, and the skin assumes a lighter edematous appearance, suggesting a tendency to blister, and the bright color reaction invades the neighboring skin, extending to quite a considerable distance. When the swelling is slight or absent, the color of the reaction is much darker, and is often delayed in appearance, in which case it is advisable to see the patient again in three days before arriving at a definite conclusion. A darker reaction usually means an old infection. It may be so dark as to be nearly black, and that means that the case is old, quiescent, or one which will terminate fatally because of little or no resistence. The general condition of the patient will easily decide which of the two interpretations is to be recorded.

A positive reaction with the 1–100 dilution is one that is considered as showing presumptive evidence of active tuberculosis, when it is definitely of a color as bright as the lips, and when definite swelling has occurred.

A positive reaction with the 1–500 dilution generally means good resistance and more or less recent extension, except when glands or skin tissues are involved, as these practically always give a positive reaction with this dilution. The darker colored reaction either means failing resistance, a very serious sign in a case possessing other evidences of tuberculous degeneration, or, when the case shows no signs of activity, a condition of very satisfactory stabilization. This often shows itself by a positive reaction in the 1–10 dilution but with dark color, and with the 1–100 dilution showing no swelling and slight dark discoloration.

According to Ellis, a positive reaction with the 1–100 dilution is a presumptive evidence of the existence of active tuberculosis in the ratio of 9 to 1, or, in other words, 90 per cent of all cases will show evidence of active tuberculosis.

In cases showing a negative or slight reaction, the evidence is against active tubercular disease. One must be careful not to in-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

clude a delayed color reaction as entirely negative, and cases showing delayed reaction should be further investigated.

COMMENT ON THE ELLIS TEST.

Krause showed in experimental tuberculosis that the cutaneous hypersensitivity to tuberculin is increased in progressive disease, is diminished by healing and increased by reinfection.

Krompecker and Romer demonstrated that the more virulent the infection the greater is the degree of hypersensitivity to tuberculin in animals. However, they also showed that no such fixed relationship exists in man, and this has been confirmed by other observers.

Apparently, in Ellis's hands, this definite relationship in man may be demonstrated by his modification of the von Pirquet test.

The disirability for such a test is inestimable. Valuable as it would be as a routine recruiting procedure, its usefulness as a rapid diagnostic method in school children, in industrial medicine, and general out-patient work would make it of greater value than the complement-fixation test for lues.

Actuated by these considerations, the Bureau of Medicine and Surgery made arrangements for a clinical trial of the efficacy of the Ellis test.

Scope of investigation.—As originally planned, on the basis that we could duplicate Ellis's reactions, it was proposed to use the test on a series of several hundred tuberculous patients in various stages of the disease and on two hundred nontuberculous individuals as controls.

However, in the first 100 patients tested it was found that the test was not showing anything near the degree of accuracy which Ellis claims for it. Because of the possibility that a faulty technique might be responsible for these results, it was decided to make various minor changes in the application of the test, and to obtain, if possible, results approximating those of Ellis before gathering the originally proposed number of cases.

A short protocol was made of each case, consisting of name, age, nativity, color, length of time tuberculous, and present condition. Under the present condition symptoms and signs of activity, progression or quiesence were recorded together with laboratory findings.

The tuberculous cases are roughly divided into three clinical groups—(1) acutely failing, (2) slowly failing, (3) stationary. All were in the advanced stages and none had active surgical or skin tuberculosis.

Following is a tabulation of each group, with a summary and discussion of results.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

In addition there is tabulated the reactions obtained in two nontuberculous control series, and another table showing the results of a 24-hour inspection of the reaction for 4 days.

In the tables will be found 15 tuberculous and 14 nontuberculous cases in whom the test was repeated.

Summary of Table 1.

Reaction.	Dilutions.					
	1-500		1-100		1-10	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Positive (red and swollen).....	4	9	9	21	14	32
Negative (no redness; no swelling).....	24	56	11	25	6	14
Indeterminate (pink and swollen).....	12	27	17	39	17	39
Negative; indeterminate (color without swelling or swelling without color).....	3	7	6	14	6	14

Summary of Table 2.

Reaction.	Dilutions.					
	1-500		1-100		1-10	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Positive (red and swollen)....	14	32	17	39	19	44
Negative (no redness; no swelling).....	5	11	3	7	0	0
Intermediate (pink and swollen).....	23	52	22	50	22	50
Negative; indeterminate(color without swelling or swelling without color).....	2	4	2	4	3	6

Summary of Table 3.

Reaction.	Dilutions.					
	1-500		1-100		1-10	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Positive (red and swollen)....	11	26	17	42	20	48
Negative (no redness; no swelling).....	7	17	2	4	0	0
Indeterminate (pink and swollen).....	22	52	21	50	20	48
Negative; indeterminate (color without swelling or swelling without color).....	2	5	2	4	2	4

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Discussion of reactions in active tuberculosis.—According to Ellis, we should have obtained in Table 1 frankly positive reactions in 90 per cent of the cases in all three dilutions, and essentially the same results in Table 2. We should, however, expect many of the black reactions of failure in Table 1.

In Table 3 there should be a distinct change in that the 1–500 dilution should show few positives, but the 1–100 and 1–10 dilutions should again give 90 per cent of frankly positive reactions. Here, too, we should expect to find many of the black reactions—those indicative of good resistance in this case.

A survey of the summarized tables will show how utterly we failed to even approximate Ellis's results, in that we obtained but 34 per cent of positives in contrast to the 90 per cent which Ellis reports.

However, if by long experience in studying this skin reaction one could place in the positive class those reactions attended by swelling and a color we described as pink, the percentage of positives in the 1–100 dilution in Tables 1, 2, and 3 would be, respectively, 60, 89, and 92 per cent.

The reactions occurring in the controls are ascribed to trauma or hypersensitiveness to the phenol in the diluent.

The test was deliberately applied to the second series of negative controls with a knife that was comparatively blunt. The traumatic element in the reaction may be partially judged by a comparison of the control readings in the two series of negative controls.

It will be noticed that a reaction in the control is relatively more frequent in the cases after 114, in the retests, and in the second series of negative controls.

This is undoubtedly due in part to the fact that when the tests referred to were performed the drops were approximately eight times the size of the drops used on the cases prior to 114 and on the first series of negative controls.

It is highly probable that the number of persons reacting to the infinitesimal quantity of phenol in the smaller drop is appreciably increased when the larger sized drop is used.

Although Ellis specifies a small drop of the different solutions in performing the test, we used larger drops in one of the several modifications tried because of the possibility that amounts used in the earlier tests were too small.

In all repeated tests, except case 7, Table 1, an area as near as possible to the first test was used. The tests were repeated after an interval of approximately two weeks, as many of the first reactions did not subside until then.

Von Pirquet's observations would indicate that we should expect a more intense reaction following the second test. This occurred in the majority of instances, though not universally.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Summary of Table 4.

Reaction.	Dilutions.					
	1-500		1-100		1-10	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Positive (red and swollen).....	3	9	5	14	8	22
Negative (no redness; no swelling).....	12	34	10	28	7	19
Indeterminate (pink and swollen).....	6	17	7	19	8	22
Negative; indeterminate (color without swelling or swelling without color).....	15	42	14	39	13	37

Summary of second series negative control.

Reaction.	Dilutions.					
	1-500		1-100		1-10	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Positive (red and swollen)....	1	5	3	16	7	39
Negative (no redness; no swelling).....	0	0	1	5	1	5
Indeterminate (pink and swollen).....	7	39	8	44	10	55
Negative; indeterminate (color without swelling or swelling without color).....	10	55	6	33	0	0

Discussion of reactions in the nontuberculous.—In the series of negative controls in Table 4 we should have obtained 90 per cent of negative reactions in the 1–100 dilution instead of the 28 per cent recorded.

The reactions of swelling without discoloration, and vice versa, are undoubtedly negative reactions. It is also possible, as indicated above, that one highly skilled in determining the more subtle color gradations might find sufficient justification to place those reactions of swelling with pink color among the negative reactions. Then, in combining these figures with those of the frankly negative responses, we would have, instead of 28 per cent, an accuracy of 86 per cent.

The doubtful shades of red and pink in reactions were invariably checked by other persons, and no distinguishing features could be observed in the indeterminate reaction in active tuberculosis and that in the nontuberculous.

Three of the four nontuberculous controls giving frankly positive reactions in the 1–100 dilution were investigated especially for evidence of active tuberculosis. No symptoms or signs of active tuberculosis were present, though in two (Nos. 23 and 25) physical signs of an old, inactive, apical infiltration were present, which was con-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

firmed by X ray. The third patient, a case of tertiary lues, had no lung symptoms or signs. As none of the cases were coughing, sputum examination could not be made. For further proof of their being nontuberculous, subcutaneous tuberculin was considered, but because of the possibility of a reaction from the tuberculin administered by the Ellis test it was not given.

The retested cases in this series gave substantially the same relative reaction as in the cases of active tuberculosis.

No conclusions can be drawn from the second series of negative controls, as all the reactions are masked by the reaction of trauma. It is merely appended for comparison.

TABLE 1.—*Acutely failing advanced tuberculosis.*

Case No.	Control.	1-500	1-100	1-10
1	Negative	Red; slight swelling	Red; slight swelling	Red; still more swelling.
2	do	Pale red; slight swelling	Pale red; more swelling.	Do.
3	do	Negative	Red; swollen	Red; more swelling.
5	do	do	Pink; swollen	Pink; more swelling.
6	do	Pink; slight swelling	do	Do.
7	do	Negative	Negative	Red; slight swelling.
	do	do	No color; slight swelling	No color; more swelling.
8	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling. *
10	do	do	do	Blackish; same swelling.
12	do	Negative	Pink; slight swelling	Pink; slight swelling.
14	do	do	Negative	Negative.
16	do	do	Pink; slight swelling	Pink; more swelling.
17	do	do	No color; slight swelling	No color; more swelling.
18	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
19	do	Negative	Red; slight swelling	Red; more swelling.
21	do	do	Negative	Slight discoloration; no swelling.
22	do	Pink; slight swelling	Pink; slight swelling	Pink; slight swelling.
24	do	Negative	Negative	Negative.
25	do	No color; slight swelling.	No color; more swelling.	No color; slight swelling.
29	do	Negative	Negative	Negative.
30	Red; no swelling	do	Red; no swelling	Red; no swelling.
	Negative	Pink; no swelling	Red; slight swelling	Red; slight swelling.
31	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
32	do	Negative	Negative	Red; slight swelling.
33	do	Pink; no swelling	Pink; no swelling	Pink; no swelling.
35	do	Negative	Red; slight swelling	Red; more swelling.
37	Brown; slight swelling	do	Brown; no swelling	Brown; slight swelling.
39	Negative	do	Negative	Pink; slight swelling.
40	do	Slight brown; slight swelling.	More brown; more swelling.	More brown; still more swelling.
43	do	Pink; slight swelling	Pink; more swelling	Pink; much swelling.
44	do	Negative	Pink; slight swelling	Red; more swelling.
45	do	Pink; slight swelling	More pink; more swelling.	Slight more pink; slight more swelling.
46	do	Negative	Negative	Negative.
48	do	do	Red; slight swelling	Same reaction.
49	do	do	Negative	Negative.
52	do	do	do	Brown; slight swelling.
71	do	Brown; slight swelling.	Brown; more swelling.	Pink; more swelling.
72	do	Pink; no swelling	Red; slight swelling	Red; swollen.
90	Pink; no swelling	do	Pink; no swelling	Pink; no swelling.
	Brownish; no swelling.	Brownish; no swelling.	Brownish; no swelling.	Brownish; no swelling.
100	Pink; no swelling	Pink; slight swelling	More pink; more swelling.	Slight more; pink; slight more swelling.
	do	Red; slight swelling	Red; swollen	Red; more swelling.
101	Negative	Negative	Brownish pink; slight swelling.	More reaction.
119	do	Pinkish brown; slight swelling.	Pink; more swelling	Pink; still more swelling.
121	do	Negative	Negative	Negative.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE 2.—*Slowly failing advanced tuberculosis.*

Case No.	Control.	1-500	1-100	1-10
4	Negative	Red; slight swelling	Red; more swelling	Red; still more swelling.
9	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
11	do	do	do	Deeper pink; still more swelling.
13	do	do	do	Pink; more swelling.
23	do	Red; slight swelling	Red; more swelling	Red; still more swelling.
26	do	Slight pink; slight swelling.	Pink; more swelling	Deeper pink; still more swelling.
28	do	Red; slight swelling	Red; slight swelling	More red; same swelling.
36	Red; slight swelling	Same	Slightly more reaction	Still more reaction.
	Negative	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
41	do	do	Red; more swelling	Red; same swelling.
47	do	Pink; no swelling	Red; slight swelling	Do.
51	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
53	do	do	Deeper pink; more swelling.	Same color; still more swelling.
56	do	Light brown; slight swelling.	Pink; slight swelling	Deeper pink; more swelling.
57	do	Red; slight swelling	Red; more swelling	Red; still more swelling.
58	do	do	Red; swelling	Deeper red; more swelling.
62	do	do	Red; more swelling	Red; still more swelling.
63	do	Brown; slight swelling	Pink; more swelling	Do.
70	do	Slight red; slight swelling.	Slight red; more swelling.	Do.
74	do	Negative	Slight pink; slight swelling.	Pink; more swelling.
75	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
76	do	Slight brown; slight swelling.	do	Deeper pink; still more swelling.
78	do	Negative	Negative	Red; swollen.
81	do	Pink; slight swelling	Red; more swelling	Red; still more swelling.
82	do	Brownish pink; slight swelling.	Same color, more swelling.	Deeper color; still more swelling.
86	do	Red; slight swelling	Red; more swelling	Red; still more swelling.
87	do	Negative	Negative	Brownish pink; slight swelling.
92	Pink; slight swelling	Pink; more swelling	Red; swollen	Red; more swollen.
	Brown; no swelling	Brownish pink; slight swelling.	Pink; more swelling	Pink; still more swelling.
94	Pink; slight swelling	Pink; swelling	do	Pink; still more swelling.
	Red; no swelling	Red; slight swelling	Red; more swelling	Red; still more swelling.
95	Red; swelling	Red; swelling	More reaction	Still more reaction.
	Pink; no swelling	Brownish pink; slight swelling.	Pink; more swelling	Red; still more swelling.
97	Pink; slight swelling	Pink; swollen	Red; more swollen	Red; further swelling.
	Brown; no swelling	Brownish pink; slight swelling.	Pink; slight swelling	Pink; slight swelling.
102	Negative	Pink; swelling	Deeper pink; more swelling.	Darker pink; still more swelling.
103	do	Slight brown; slight swelling.	Same reaction	Same reaction.
104	do	Negative	Negative	Slight swelling; no color.
107	do	No color; slight swelling.	Same	Same.
108	do	Slight brown; slight swelling.	do	Do.
110	do	Red; slight swelling	More reaction	Still more reaction.
112	Slight brown; no swelling.	Brownish pink; slight swelling.	Same color; more swelling.	Same reaction.
	Pink; no swelling	Pink; slight swelling	Pink; swelling	Pink; more swelling.
115	Negative	Red; slight swelling	Red; more swelling	Red still more swelling.
116	do	Brown, slight swelling	Brown more swelling	Brown, still more swelling.
117	Brown; no swelling	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
118	Negative	Negative	No color; slight swelling.	No color; more swelling.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE 2.—*Slowly failing advanced tuberculosis*—Continued.

Case No.	Control.	1-500	1-100	1-10
122	Pink; no swelling.....	Pink; slight swelling...	Pink; more swelling....	Pink; still more swelling.
126	do.....	Pink; no swelling.....	Pink; slight swelling...	Pink; more swelling.
130	Negative.....	Pink; slight swelling...	Pink; swelling.....	Do.

TABLE 3.—*Stationary active tuberculosis.*

Case No.	Control.	1-500	1-100	1-10
15	Negative.....	Red; slight swelling....	Red; slight swelling....	Red; more swelling.
20	do.....	Negative.....	Slight black; no swelling.	Same.
27	do.....	Pink; slight swelling...	Pink; swollen.....	Pink; more swelling.
34	do.....	Red; slight swelling....	Red; more swelling....	Red; still more swelling.
38	do.....	Negative.....	Pink; slight swelling...	Pink; more swelling.
54	do.....	Brown; slight swelling.	Darker brown; more swelling.	Red; more swelling.
55	do.....	Negative.....	Brownish pink; slight swelling.	Do.
59	do.....	Pink; slight swelling...	Pink; more swelling....	Pink; more swelling.
60	Pink; slight swelling..	Red; more swelling....	Red; still more swelling.	Red; still more swelling.
61	Negative.....	Red; slight swelling....	Red; more swelling....	Do.
64	do.....	Negative.....	Negative.....	Red; slight swelling.
65	do.....	Pink; slight swelling...	Pink; more swelling....	Red; still more swelling.
66	do.....	do.....	do.....	Deeper pink; still more swelling.
67	Pink; no swelling.....	Red; slight swelling....	Red; more swelling....	Red; still more swelling.
	do.....	Pink; slight swelling...	do.....	Do.
68	Negative.....	Red; slight swelling....	do.....	Do.
69	do.....	do.....	do.....	Do.
73	do.....	do.....	do.....	Do.
77	do.....	Negative.....	Negative.....	Red; swollen.
79	do.....	Brownish pink; slight swelling.	Same color; more swelling.	Same color; still more swelling.
80	do.....	Pink; slight swelling...	Pink; more swelling....	Darker pink; still more swelling.
83	do.....	do.....	Red; more swelling.....	Red; still more swelling.
84	do.....	do.....	Pink; more swelling....	Deeper pink; still more swelling.
85	do.....	do.....	Pink; slight swelling...	Deeper pink; more swelling.
89	Brownish pink; slight swelling.	Same color; more swelling.	Same color; still more swelling.	Reddish brown; still more swelling.
	Negative.....	Brown; slight swelling.	Pink; more swelling....	Brownish pink; still more swelling.
	do.....	Pink; slight swelling...	Red; swollen.....	Red; more swollen.
98	do.....	Negative.....	Pink; swollen.....	Pink; more swelling.
99	Pink; no swelling.....	Pink; slight swelling...	Red; more swelling.....	Red; still more swelling.
	Negative.....	Red; slight swelling....	do.....	Do.
105	Slight brown; no swelling.	More brown; no swelling.	More brown; no swelling.	Brownish pink; no swelling.
109	Pink; no swelling.....	Light red; slight swelling.	Red; more swelling.....	Red; still more swelling.
111	Negative.....	Brownish pink; slight swelling.	Same reaction.....	Same reaction.
120	do.....	do.....	Same color; more swelling.	Pink; still more swelling.
113	do.....	Negative.....	Pink; slight swelling...	Pink; slight swelling.
114	do.....	Slight pink; slight swelling.	Slight pink; more swelling.	Slight pink; still more swelling.
123	do.....	Pink; slight swelling....	Pink; more swelling ...	Pink; still more swelling.
124	Pink; no swelling.....	do.....	do.....	Do.
125	Negative.....	do.....	do.....	Do.
127	Brownish pink; no swelling.	Same color; slight swelling.	Pink; swollen.....	Pink; more swelling.
128	Negative.....	Red; swollen.....	Red; more swollen.....	Red; still more swollen.
129	do.....	Pink; slight swelling...	Red; swollen.....	Red; more swelling.
131	do.....	Brown; no swelling....	Pink; swollen.....	Pink; more swollen.
132	Pink; no swelling.....	Pink; slight swelling...	Red; swollen.....	Red; more swollen.
133	do.....	do.....	Pink; swollen.....	Pink; more swollen.
134	Negative.....	Red; swollen.....	Red; more swollen.....	Red; still more swollen.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE 4.—*Controls nontuberculous.*

Case No.	Control.	1-500	1-100	1-10
1	Negative	Negative	Negative	Red; slight swelling.
2	do	do	do	Negative.
3	Red; slight swelling	Same	More	More.
4	Negative	Negative	Negative	Negative.
5	Deep red; no swelling	Deep red; no swelling	Deep red; no swelling	Deep red; no swelling.
	Pink; no swelling	Red; no swelling	Pink; no swelling	Red; no swelling.
6	Negative	Light pink; slight swelling.	More pink; more swelling.	Less pink; same swelling.
	do	Pink; slight swelling	Red; more swelling	Red; still more swelling.
7	do	Negative	Negative	Negative.
8	do	Slight red; no swelling	Slight red; no swelling	Slight red; no swelling.
9	do	Negative	do	Do.
	Pink; no swelling	Pink; no swelling	Pink; no swelling	Pink; slight swelling.
10	do	do	do	Pink; no swelling.
	Brown; no swelling	Brown; slight swelling	Pink; more swelling	Pink; same swelling.
11	Negative	Pink; swollen	do	Pink; still more swelling.
	Pink; no swelling	Pink; slight swelling	do	Do.
12	Red; no swelling	Red; no swelling	Negative	Negative.
13	Negative	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
14	do	Negative	Negative	Negative.
15	Slight pink; no swelling.	Slight pink; no swelling.	Slight pink; slight swelling.	Slight pink; slight swelling.
	Negative	Negative	Brown; slight swelling	Brown; more swelling.
16	do	do	Negative	Red; slight swelling.
17	Pink; no swelling	Pink; no swelling	Pink; no swelling	Pink; no swelling.
	Brown; no swelling	Brown; no swelling	Brownish pink; swollen	Pink; more swelling.
18	Pink; no swelling	Pink; no swelling	Pink; no swelling	Pink no swelling.
19	Negative	Negative	Slight red; no swelling	Slight red; no swelling.
20	do	Slight pink; slight swelling.	Slight pink; more swelling.	Slight pink; still more swelling.
21	Pink; no swelling	Pink; no swelling	Red; no swelling	Red; no swelling.
	Brown; swollen	Red; swollen	Red; more swelling	Red; still more swelling.
22	Negative	Slight brown; no swelling.	Slight brown; no swelling.	Slight brown; no swelling.
23	do	Red; very slight swelling.	More red; very slight swelling.	Still more red; very slight swelling.
	Brown; no swelling	Brown; no swelling	Brown; no swelling	Brown; no swelling.
24	Negative	Slight pink; slight swelling.	Red; slight swelling	Red; more swelling.
25	Pink; no swelling	Pink; no swelling	Red; swollen	Red; swollen.
	Brown; no swelling	Brown; slight swelling	do	Red; more swelling.
26	Slight red; no swelling.	Slight red; no swelling	Slight red; no swelling	Slight red; no swelling.
	Pink; slight swelling	Red; more swelling	Red; still more swelling.	Red; further swelling.
27	Slight pink; no swelling.	Slight pink; no swelling.	Slight pink; no swelling.	Slight pink; no swelling.
	do	Slight pink; slight swelling.	Slight pink; more swelling.	Slight pink; still more swelling.
28	Negative	Negative	Negative	Negative.
29	do	Pink; no swelling	Pink; no swelling	Pink; no swelling.
30	do	Negative	Negative	Negative.
31	do	do	do	Slight pink; no swelling.
32	do	do	Pink; slight swelling	Pink; still more swelling.
33	do	Red; slight swelling	Red; more swelling	Red; still more swelling.
34	do	Pink; slight swelling	Pink; more swelling	Pink; still more swelling.
35	Slight brown; no swelling.	Slight brown; no swelling.	Slight brown; no swelling.	Slight brown; slight swelling.
	Slight pink; no swelling.	Pink-brown; slight swelling.	Pink-brown more swelling.	Pink-brown; still more swelling.
36	Slight red; no swelling.	Slight red; no swelling	Slight red; no swelling	Slight red; slight swelling.
	Pink; no swelling	Red; slight swelling	Red; more swelling	Red; still more swelling.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Second series of controls with modified technique.

Case No.	Control.	1-500	1-100	1-10
1	Brown; no swelling...	Pink; slight swelling...	Pink; more swelling....	Pink; still more swell-swelling.
3	Pink; no swelling.....	Brownish pink; slight swelling.	More reaction.....	Red; swollen.
4	do.....	Pink; no swelling.....	Pink; no swelling.....	Pink; slight swelling.
5	Brown; no swelling...	do.....	do.....	Red; slight swelling.
6	Pink; no swelling.....	Red; slight swelling....	Red; slight swelling....	More red; slight swelling.
7	Brown; no swelling...	Brown; no swelling....	Brown; slight swelling.	Brown; swollen.
8	do.....	Red; no swelling.....	Red; no swelling.....	Red; slight swelling.
9	do.....	Brownish pink; no swelling.	Brownish pink; no swelling.	Pink; slight swelling.
10	do.....	Pink; no swelling.....	Red; slight swelling....	More reaction.
11	do.....	Pink; slight swelling...	More reaction.....	Still more reaction.
12	Pink; no swelling.....	do.....	do.....	Red; swollen.
13	Negative.....	Negative.....	Negative.....	Negative.
14	Brown; no swelling...	Pink; slight swelling...	Pink; slight swelling...	Pink; more swelling.
15	do.....	Brown; no swelling....	Brown; no swelling....	Pink; slight swelling.
16	do.....	do.....	do.....	Do.
17	Pink; no swelling.....	Pink; slight swelling...	More reaction.....	Still more reaction.
18	Slight pink; no swelling.	do.....	Pink; more swelling....	Do.
19	Brown; no swelling...	Brown; no swelling....	Pink; slight swelling...	More reaction.

TABLE 5.—*Reaction read at 24-hour intervals.*

Case No.	Reaction.	24 hours.				48 hours.				72 hours.			
		Control.	1-500	1-100	1-10	Control.	1-500	1-100	1-10	Control.	1-500	1-100	1-10
5	Color	P	P	P	P	P	R	P	R	P	R	P	R
	Swelling	0	0	0	0	0	0	0	0	0	0	0	0
6	Color	P	BP	P	P	0	P	R	R	0	P	P	P
	Swelling	0	0	SS	S	0	4	9	11	0	4	9	11
9	Color	P	P	P	P	P	P	P	P	P	P	P	P
	Swelling	0	0	0	0	0	0	0	SS	0	0	0	S
10	Color	P	R	R	R	Br	Br	P	P	BP	BP	R	R
	Swelling	0	SS	S	MS	0	4	7	8				
11	Color	P	P	P	P	P	P	P	P	0	P	P	P
	Swelling	0	SS	S	MS	0	5	7	7	0	4	8	10
15	Color	P	P	P	P	0	0	Br	Br	0	0	Br	Br
	Swelling	0	0	SS	MS	0	0	SS	MS	0	0	0	SS
17	Color	P	P	R	R	Br	Br	BP	P	Br	Br	BP	BP
	Swelling	0	0	S	MS	0	0	4	7	0	0	7	7
21	Color	P	R	R	R	B	R	R	R	Br	R	R	R
	Swelling	0	VSS	S	MS	3	3	5	7	0	4	7	10
23	Color	R	R	R	R	B	B	B	B	B	BP	P	P
	Swelling	0	0	SS	MS	0	0	0	0	0	0	0	0
25	Color	PB	R	R	R	B	B	R	R	0	0	R	R
	Swelling	0	VSS	S	MS	0	SS	10	18	0	0	8	10
26	Color	P	P	P	R	P	R	R	R	FP	R	R	R
	Swelling	S	MS	SMS	SMS	3	4	5	9	0	5	5	7
27	Color	P	P	P	P	FP	FP	FP	FP	Br	R	R	R
	Swelling	0	0	0	S	0	4	7	11	0	5	7	11
35	Color	P	R	R	R	FP	PB	PB	PB	B	BP	BP	BP
	Swelling	0	0	S	MS	0	5	6	7	0	5	9	20
36	Color	P	R	R	R	P	R	R	R	Black.	Black.	Black.	Black.
	Swelling	0	S	MS	SMS	0	5	7	12	0	5	7	15

Explanation of Table 5.—The letters used to describe the color of the reaction, FP, BP, P, Br, B, and R indicate, respectively, faint pink, brownish pink, pink, brown, and red. Black when occurring is written out.

The letters used to describe swelling—VSS, SS, S, MS, and SMS—indicate, respectively, very slight swelling, slight swelling,

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

swollen, more swollen, and still more swollen. Despite the fact that it was exceedingly difficult in some cases to determine exactly the extent of the reaction, the diameter of the reaction was measured in millimeters and recorded in the 48 and 72 hour readings.

The later readings were made without consideration of former ones. The discrepancies in cases 10 and 23 may be due to the reading attempted in a poor light. The change in the third reading of case No. 36 is undoubtedly one of trauma. This patient, a hypersensitive neurological case, complained of intense itching after the second reading and rubbed and bruised the reactions through the dressings in an effort to alleviate the irritation. The result was the only really black reaction obtained.

This table is instructive in that it shows the marked variation in the reaction of the organism to the Ellis test.

All these cases had a previous Ellis test, as they were selected from the first series of negative controls described in Table 4.

CONCLUSIONS.

1. In a series of 136 known cases of active, advanced, pulmonary tuberculosis the Ellis test gave only 34 per cent of definite positive reactions.

2. In a series of 36 clinically nontuberculous individuals it gave 28 per cent of definite negative reactions and 14 per cent of positive reactions.

3. It was shown to react positively in the presence of healed, inactive, apical infiltration.

4. No prognostic conclusions could be inferred from the test.

The following statement of Thomas Lewis regarding special tests is peculiarly apropos to the matter under consideration:

"A medical man does well who pins his faith to clear signs of disease, discountenancing such signs as are of more dubious value. Another consideration affects the views expressed to a not unimportant extent; it is that the value of a method of diagnosis is to be assessed, not by the success with which it is employed in specially trained hands, but by its success when employed by the average man. When a professed expert introduces a new diagnostic test or revives an old one, even though he may be able to show that in his hands it has great value, which is not always the case, yet by its advertisment he will do more harm than good unless he is able to state the method of his test so clearly, and unless the test is so simple that it is easily acquired and used by the majority of his professional brethren. Assuredly the method will be attempted on his authority, whether rightly used or not; as is perfectly well

Digitized by Google Original from UNIVERSITY OF MICHIGAN

known in specific instances, the test may be improperly applied and quite erroneous conclusions drawn from it."

I wish to express my most appreciative thanks to Dr. Walter H. Conley, medical superintendent of the Metropolitan Hospital, New York City, for making possible this clinical trial of the Ellis test in an institution with such abundant and excellent clinical material. To Dr. N. W. Thompson, assistant medical superintendent; Dr. G. L. Raynor, chief of the visiting medical staff; and Dr. J. R. Lisa, visiting pathologist, I am most deeply indebted for their very cordial interest, hearty cooperation, and many valuable suggestions.

CANCER IN ST. CROIX, VIRGIN ISLANDS.

By C. B. Van Gaasbeek, Lieutenant, Medical Corps, United States Navy.

The object of this paper is to discuss the incidence of cancer in St. Croix, based upon the mortality during the past two and one-half years, and to offer an explanation of the infrequency of the disease in St. Croix.

The statistics quoted in this paper were obtained from the clinical records of the Christiansted Municipal Hospital and the Frederiksted Municipal Hospital and the official death certificates and the writer's own observation of some of the cases.

During the past two and one-half years, i. e., from January 1, 1921, to July 1, 1923, among the 5,720 patients treated in the hospitals on the island there have occurred 16 cases of cancer. Of these, 2 cases may safely be disregarded, since the diagnoses were evidently erroneous, and a third case was very doubtful. One case diagnosed carcinoma of the stomach proved on autopsy to be gastric ulcer. The second case was diagnosed carcinoma of the testis with metastases to the inguinal glands. In this case the testis and some of the glands were removed. The operative wound later broke down and gonococci were obtained in the discharge. This patient is living and well two years later. The third case was diagnosed gastric carcinoma on clinical signs alone. He was sick only 45 days when he died. No autopsy was performed. However, this third doubtful case is included in the list of cancers.

Of the 14 authentic cases of cancer, the distribution was as follows: 4 epitheliomata, including 1 of the tongue, 2 of the face, and 1 of the anus; 3 carcinomata of the breast; 5 carcinomata of the uterus; 1 carcinoma of the liver, metastasized from the head of the pancreas; and 1 carcinoma of the stomach.

The age limits varied from 19 years to 87 years, with an average age of 51.1 years. The youngest was the epithelioma of the anus and the eldest was an epithelioma of the face.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Of this group of 14 cancers, 4 occurred in males while 10 occurred in females, a ratio of 2 to 5. Although this is a high ratio of female and male cancer, it is not at all uncommon, since cancer is so prone to develop in the female reproductive organs. Five cases occurred in negroes, 8 in mixed races, and 1 in a white man.

The principal occupation of both the male and female population of St. Croix is field labor in the cultivation of sugar cane. But in this group of cancer cases there were but three field laborers; the remaining 11 cases occurred in people of a relatively higher vocation, such as fishermen, housemaids, housewives, seamstresses, and pasture men.

It is of interest to note that of the 5 cases of uterine cancer, four of the women have been married and the fifth had borne children.

The population of St. Croix in 1922 averaged about 13,500 inhabitants. Of this total number there were less than 650 white people. This would give a total cancer mortality of 41.2 per 100,000.

In Charleston, S. C., the cancer rate for the white population is 73.2 per 100,000, while the rate for the black people is 36.6. In the District of Columbia the cancer rate for whites between the years 1901–1910 was 175.4, while for the blacks during the same period it was 125.1.

It is interesting to note that in the United States prior to the Civil War, cancer among the negro population was relatively rare. But at the present time, under the conditions of unrestrained personal freedom, the difference in cancer mortality, decidedly less pronounced, though as a rule the general cancer rate is still considerably in excess of the cancer death rate of the negro.

For the years 1910–1912, the cancer rate of the negro in all the United States was 56.1, while the rate for the white people was 76.7. Hence, it is shown that cancer generally is less prevalent among the negroes.

In our sister island, St. Thomas, the cancer rate from 1905 to 1914 averaged about 80 per 100,000.

To account for the low cancer rate of St. Croix as compared with the various districts of the States and with the United States as a whole and even with St. Thomas, it is necessary to consider the causes or rather influences which seem to effect the production of cancer.

The true cause of cancer is as yet unknown. Guerin insists that we must recognize the infectious origin of some cancers, irritation or trauma as a factor in others, and an embryonal origin of still others. In the present state of our knowledge, however, a specific microbic origin of cancer is generally not accepted.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

It is certain that precancerous conditions do exist. They are all of the keratotic type, are inflammatory, result from long-standing irritation, and end either in ulceration or hyperplasia.

According to Parker Sims, benign tumors, chronic ulcerations, chronic inflammations, and abnormal tissues, such as scars, are foremost among precancerous conditions.

Greer, in his treatise "Industrial Diseases and Accidents," states that the relation of injury to the development of cancer has received a great deal of attention, the result being that we are in a position to give traumatism a place among the factors which influence the production of malignant growths. The real cause, however, is unknown. At present we have a number of observations which lead us to suspect that continued local irritation can determine the development of malignant growths. Under this type we recognize the chimney sweep's cancer, clay-pipe cancer, X-ray cancer, Kangri cancer of Kashmir, and the betel-nut cancer of India.

In a great number of deep cancers, such as those of the abdomen, bone, or muscles, there is not a history of continued irritation but rather of a single injury. In this same respect, Oliver says that there is no doubt that cancerous tumors develop after an accident, close to the site of the injury, and that one is the direct sequence of the other.

Cancer is especially common among gardeners and agriculturists. This is supposed to be due to handling infected earth. The condition generally occurs upon the skin. In this respect it would seem remarkable that there is not a greater incidence of cancer in St. Croix, when it is considered that the greater part of the population go without shoes and, besides, work in the cane fields, where they sustain many cuts, bruises, and ulcers that remain months and sometimes years without healing.

Thirty per cent of our cancers were of the epithelioma type. But, strange to say, while ulcers and injuries to the feet and hands were so common, there was not a case of epithelioma of these parts. Neither did an epithelioma occur in a field worker, and only one in a negro, while two were in patients of mixed blood and one was in a white man. It would seem that there is something protective in the negro, although precancerous conditions are abundant.

The latest theories hold more toward the traumatic or irritative cause of cancer. Credit is due to Yamagiwa and Ichikawa, of the University of Tokyo, who first produced cancer experimentally by the application of tar to the skins of rabbits. Other investigators and experimenters, notably Leitch, Murray, Dellman, and Roussy, have more recently corroborated these findings. Passey has produced cancer by means of quicklime mixed with soot.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

It is believed that solar irritation may be a factor in the production of cutaneous cancer. Gougerot regards the action of sunlight as an important factor in the production of cancer. Sunlight may be a factor, but surely is not causative, for the sun shines every day for nearly the entire day on St. Croix; and were this the cause of cancer, everyone would be cancerous.

After considering the above it would seem that most of the factors which are believed to influence the production of cancer are present. There is an abundant sunlight, a goodly number of benign tumors, many traumatic causes, and a great number of chronic irritations from long-standing inflammation in the field laborers who are engaged in the cane fields. And yet the cancer rate is very low.

The majority of people of St. Croix are negroes. They are poor and for the most part ill fed, living upon fungi and fish, and are consequently poorly nourished. Although in former days, prior to the advent of prohibition, alcohol was indulged in, it was rarely used to the extent seen in more prosperous people. Smoking has always been common. The clay pipe is generally employed for this purpose. Although the younger generation use beautifiers, cosmetics, powders, etc., the elderly people who are in the cancer age have never known these luxuries, many of them having been slaves. In St. Croix large families live together in one room. The people have little or no ideals and live only for the day. They approach the lowest social stratum. It is probable that their physical condition, habits, and mode of living exempt them in a large extent from cancer. Hoffman says that the rarity of cancer among the native races suggests that the disease is primarily induced or at least increased in relative frequency by the conditions or methods of living which typify our modern civilization.

It will be seen that in our series of 14 cases, 11 occurred in people somewhat above the average of field laborers, both in living and eating. This fact would make it appear that people living under primitive conditions are relatively immune to cancer.

Roger Williams states that although it can not be said that persons of any rank or station of life are exempt from cancer, there are, nevertheless, some remarkable differences in the incidence of the disease among the various social strata. There is a greater prevalence of cancer among the well-to-do than among the less prosperous of the industrial classes.

Bulkley states that even though some fundamental cause may lie in back, nevertheless it is recognizable by all that the tissues develop and are maintained by nutrition derived from food and drink taken, and tumors all grow by the same means.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Gunsburg as early as 1853 held that conditions responsible for corpulence were the same as those for carcinoma. He attributed the abnormality of the metabolism to the excess of albuminoid diet.

Rollo Russell found that cancer was eight times more prevalent among inebriates than among the population of the country at large.

Williams found that cancer was rare among people predominately poor and of necessity frugal, subsisting on an alimentation comprising but little protein food.

Sir George Cheattle, at the Institute of Hygiene, London, deprecates the use of soaps, face powders, coloring matter, cream, bath salts, etc., as conducive to cancer by irritation of the skin. He considers soaps and powders especially dangerous since they gain access to the glands of the skin.

It has been noted by Pitchford that the increase in cancer is due to the diminution of protection to light and the increased exposure to illumination. Woolen garments have been replaced by cotton, and black and brown clothes by white. Streets are wider and brighter. This theory may explain why the dark-skinned races are less liable to malignant disease than white races in the tropical and semitropical climates.

In conclusion it may be stated that the people of St. Croix appear to be relatively less susceptible to cancer probably because of (1) their black color protecting them from the rays of the sun, the darker the individual the greater the protection; (2) simple diet, especially lacking in the highly seasoned protein foods; (3) lack of alcoholism; (4) nonuse of powders and in many cases of soap; (5) and especially their physical conditions and modes of living.

SUGAR IN URINE.

By C. W. O. BUNKER, Lieutenant Commander, Medical Corps, United States Navy, and R. L. THRASHER, Pharmacist's Mate, first class, United States Navy.[1]

Benedict's qualitative test (1) for sugar in urine has proved very useful and reliable, and we have been curious as to whether results from its use have any quantitative significance. The method of Folin and Berglund (2) for the estimation of sugars in normal urine offered a simple means of deciding the question, and we have applied it to 190 urines, 109 of which were negative by Benedict's tests, while 81 showed greenish turbidities. Depending upon the density of this greenish turbidity, we have subdivided the group into traces, slight traces, and very slight traces. Table I shows the results.

[1] From the laboratories of the U. S. Naval Medical School. Reprinted from the Journal of Laboratory and Clinical Medicine, September, 1923.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It will be noted that 88 per cent of the negative results were with urines containing 0.1 of 1 per cent or less of sugars. No sharp line, however, could be drawn as to the amount of sugars that would or would not give a positive result, although there was a tendency for the density of the greenish turbidity to vary, in general, proportionately to the amount present. Neither did we find the occurrence of a reddish precipitate that settled to the bottom of the tube had any quantitative significance.

Folin and Berglund (3) contend that the copper-reducing substances remaining in normal urine after the removal of coloring matters, uric acid, creatine, and creatinine by means of the alkaloidal reagent consist of a "motley variety of carbohydrate products and carbohydrate derivatives including di- and polysaccharides." If we consider that Benedict's test is sensitive to some of these but not to others, we can understand why values as low as 0.04 of 1 per cent could produce either a positive or a negative result, depending upon the composition of the mixture present in the urine. It may also be that the relative proportions of fermentable to nonfermentable copper-reducing substances enter into the question, but we did not attack it from that standpoint.

Since a positive result was obtained with as little as 0.04 of 1 per cent of sugar, Benedict's qualitative test must be considered as having at least that sensitiveness.

CONCLUSIONS.

1. Benedict's qualitative test of sugar in urine has quantitative significance in only the most general terms.

2. Greenish turbidities secured in this test demand care in their interpretation, and are to be considered pathologic only when other features of the case warrant such an assumption.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TABLE I.

MILLIGRAMS SUGAR PER 100 C. C. FOUND WITH THE FOLLOWING QUALITATIVE RESULTS.

Negative.	Very slight trace.	Slight trace.	Trace.
8			
10, 11, 11, 13			
13			
20, 22, 23, 23			
26, 29			
31, 32, 33, 35			
35, 37, 38			
40, 40, 40, 40		40, 42	
40, 43, 43			
43, 43, 46			
46, 46, 46			
47			
50, 50, 50, 50			
52, 53, 53			
54, 54, 54			
54, 57, 57			
57			
60, 60, 60, 60		66	
60, 60, 60			
63, 63, 63			
66, 66, 66			
66, 66, 66			
67			
70, 71, 71, 72		75, 75	71
72, 73, 75		70, 70, 75, 75	
80, 80, 80, 80	80	80, 80, 80, 85	80, 80, 85
80, 80, 80		85, 86, 86	
85, 85, 85			
86, 86, 86			
86			
92, 92, 92	91, 95	90, 92, 92, 95	
.....		95, 95	
100, 100, 100		100, 100, 109	104, 109, 109
100, 100		109, 109	
100, 100		109	
109, 109			
110, 110, 114			110, 111, 114
114			114
120, 120, 120		120	120, 120, 120
120			128, 128
133, 133, 133		133, 133, 136	133, 133
.....			142
150	150	150, 150, 150	150, 150, 150
.....			150, 155
.....			163
.....			171, 171, 171
.....			171, 171
.....			180, 180, 180
.....			188
.....		190	
.....			200, 200
.....		218	
.....		240	224
.....			257, 257
.....			500

BIBLIOGRAPHY.

(1) Benedict, S. R.: Jour. Am. Med. Assn., 1911, lvii, 1193.
(2) Folin, O., and Berglund, H.: Jour. Biol. Chem., 1922, li, 209.
(3) *Ibid*, p. 213.

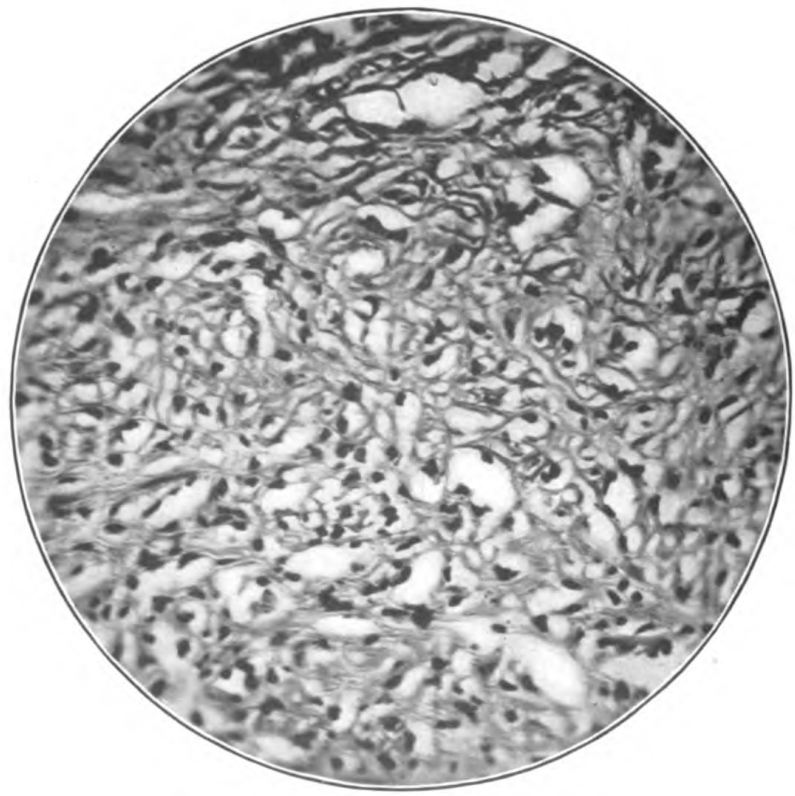
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



ENDOTHELIOMA OF PERITONEUM.

39

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

CLINICAL NOTES.

ENDOTHELIOMA.

By L. H. WILLIAMS, Lieutenant, Medical Corps, United States Navy.

The term endothelioma includes a number of tumors of uncertain origin. Much confusion has arisen due to the uncertainty as to what should be termed endothelium. The lining cells of lymph channels and blood vessels are accepted as such, but the origin of the cells which constitute the endothelium lining the dura, pleuræ, and peritoneal cavity is in dispute.

This uncertainty is caused by the failure to demonstrate the origin of the cœlom in higher vertebrates. MacCallum states that in practically no case has the origin of a tumor from endothelium been proven; and that a mere continuity of tumor cells with endothelium at the margin of the tumor is no proof of their identity.

The endothelial cell is placed with the connective tissue group and is properly recorded as a modified cell of that type of tissue. Endothelial cells resemble squamous epithelium in that they are flattened, with flattened, oval or nearly round nuclei, are polyhedrical in shape, and are in a single layer united by intercellular cement substance; the borders are wavy and often serrated. The quantity of intercellular substance is small and special staining methods are necessary to bring it out; this is just the opposite with connective tissue.

Bushman states that the term endothelioma is a compromise between the morphologic and histogenetic classification of tumors. The endothelioma is histogentically of mesoblastic or connective tissue origin, but morphologically its cellular unit most closely resembles the epithelial cell of ectodermic or entodermic origin.

Various opinions are offered as to the origin of the endothelial tumors. The cell rest theory is held by many, but as in the case of other malignant tumors their origin is unsettled. A tumor of endothelial origin may undergo a rest, or while retaining its capillary characteristics it may grow by infiltration into surrounding structures; it may become compact and solid, or become cavernous. Kettle has shown that there is no physiological connection between the blood spaces of the tumor and the vessels of the host. There is no true circulation of blood in the tumor. Small capillaries rupture and form cisterns into which the blood oozes.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The degree of malignancy of endothelioma depends not on morphology, histology, or type of original cell but on the behavior of the original cell. The richer the tumor is in undifferentiated cells the higher is its degree of malignancy. The clinical history of most endotheliomas shows them to be slow growing tumors. The location is important. If situated in a highly vascular area or one rich in lymphatics metastases occur more readily.

The case presented herewith as one of endothelioma of peritoneum has the following history: In December, 1922, the patient had severe pain in both groins, without vomiting; felt feverish; in bed for six days. Pain lasted all this time; took no drugs. At the end of this period he noticed a tumor mass in the lower abdomen. Since then he has steadily lost weight and has had pain coming in attacks, severe, cramplike, going quickly as it came, without apparent cause and unrelated to eating, to urination, or to bowel movement. With the pain there was often vomiting. He had frequency of urination with occasional burning during day but only got up once at night. This has been the case since 1918. No blood, no cloudiness, no gravel in the urine. He restricted his diet, avoiding especially meats, fried foods, and sours. He was not constipated and had no symptoms referable to the kidney or heart.

Physical examination.—Chest: Sibilant râles both bases. Heart normal. Blood pressure, 120/90. Abdomen: Tumor, size and shape of enormously distended bladder; hard and tense, but tympanitic. Rectum: Mass felt region of bladder; smooth, hard, tense.

On April 16, 1923, he was prepared for an exploratory operation. X-ray examination of the chest on this date showed fibrotic changes about the hilus.

Operation.—An inoperable growth involving the peritoneum was discovered on abdominal section. The descending colon was found adherent to the peritoneum and cut into when opening the peritoneal cavity. A glass tube was inserted and secured to the edges of the gut by a purse string to allow fecal drainage. A small nodule about 4 millimeters in diameter was taken from the peritoneum for histologic examination. It was found to be composed of stroma made up of closely packed connective tissue cells. Cell inclusions of larger cells with large pale nuclei were seen everywhere in specimen. A few mitotic figures were made out in the large nuclei.

The patient gradually lost weight and strength, though retaining a remarkable mental balance and spirit, and died 11 days after operation with symptoms and signs of broncho-pneumonia. At autopsy broncho-pneumonia was found to be immediate cause of death. All layers of peritoneum were greatly thickened, in some places as much as 1 centimeter in thickness, hard and grayish yellow in color. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

thickened peritoneum was found adherent to the intestines in the lower part of the abdomen, with the result that there was a matting together of the lower part of the colon, rectum, adjacent small intestine, mesentery, and floor of pelvis. The mesenteric lymph glands were found studded with metastatic nodules about 3 millimeters in diameter. The spleen was compressed and had a few metastatic nodules on surface. The pancreas and kidneys were apparently normal. The bladder appeared to be completely inclosed in dense, firm masses of thickened mesentery, with rigid ligaments running away to the mass of intestines.

Summary.—1. The case presented demonstrates the malignant involvement which may occur with so little interference with the functions of the intestines or bladder. Aside from a slight frequency of urination, nothing grossly abnormal occurred in the functioning of the abdominal contents.

2. The constant pain complained of, with marked loss of weight—over 30 pounds in six months—and the boardlike abdomen suggested malignancy.

3. The nature of the malignant condition was determined only by an exploratory incision and histologic examination.

4. Bushman states that according to the interpretation placed on the morphology or histogenesis of endothelial cells the tumor may be regarded as of connective tissue origin, histogenetically a sarcoma, or it may be considered as composed of cells resembling epithelium and morphological carcinoma.

5. The term endothelioma represents a compromise between morphologic and histogenetic views of tumor classification.

6. The tumor herewith presented appears a good example of the reason for the term.

REFERENCES.

Kettle, E. H.: Tumors arising from endothelium. (Proc. Roy. Soc. Med., Path. Sect: 19–34, 1918.)

Bushman, G. J.: Malignant endotheliomas with cutaneous involvement. (Archives of Derm. and Syph. December, 1922, vol. 6, pp. 680–700.)

MacCallum: Textbook of pathology.

GLANDERS IN MAN.

By L. H. Williams and R. C. Satterlee, Lieutenants, Medical Corps, United States Navy.

Glanders in man is relatively rare. Seventeen deaths were reported in the literature from 1905 to 1909. Since then many more cases have been diagnosed. Clinically glanders can be easily confused with the various manifestations of syphilis, eczema, typhus, cadaveric poisoning, pernicious anemia, nasal polyp, tuberculosis,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

rheumatism, typhoid, ague, and sarcoma. The mortality among the human cases is about 50 per cent in the acute form. The chronic form may run on for years.

The infectious agent is the *B. mallei*. The hypothetical paths of infection are through inoculation of a wound, hair follicle, or inhalation. Practically it is difficult and usually impossible to ascertain the definite point of inoculation. Animals appear to be the most prolific source of infection. Among them the horse and ass are the most frequently infected. Cattle are immune; but sheep are susceptible. Domestic pets do not entirely escape; the dog and cat are occasionally found to be harboring chronic glanders.

The nasal mucous membrane in horses infected with glanders secretes a thin, virulent mucus which is exceedingly infectious.

The period of incubation after inoculation is four to five days. *B. mallei* is a small gram negative bacillus. It grows profusely on potatoes with a characteristic slimy brown growth.

Pathology.—The characteristic lesions are infective granulomata in the skin, nares, lungs, and subcutaneous tissues. These break down and form abscesses. The abscesses vary in size from that of a pea to areas of necrosis 7 to 9 inches across, with ragged edges. The pus found in the glanders abscesses is usually red in color and gelatinous in appearance. The infection is apt to remain local, and when it spreads does so along lymph channels. Visceral lesions occur in the chronic form. Lesions in the lungs and liver are difficult to diagnosticate unless the superficial ulcerations lead to proper interpretation. They occur in the chronic form and are the terminal stage.

The principal points in diagnosis are: (1) Isolation of *B. mallei* in pure culture from local lesions; (2) positive agglutination test of both bacilli isolated with known serum and a known culture by patient's serum; (3) guinea pig inoculation with isolated bacilli with consequent localization of infection in testes which leads to destruction of testes; (4) negative blood culture.

The patient reported here is a veteran of the World War in vocational training. He was admitted to the United States Naval Hospital, Brooklyn N. Y., April 14, 1923, with symptoms of acute exacerbation of an old osteomyelitis of the head of the left humerus. He received a gunshot wound in the left shoulder October, 1918, while in battle. The head of the bone was shattered. The bullet was removed by operation three days after injury. A second operation was performed two weeks later to remove splinters of bone. The wound of the second operation healed completely with nonunion of fragments of the humerus. Partial ankylosis of the shoulder resulted from the injury. No pain or swelling was noticed after final healing until five weeks ago, when strain was put on

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the shoulder while at work. The next day pain, stiffness, and swelling were noticed in the shoulder. He was given massage and diathermy without relief. The soreness and swelling increased steadily; pain was never acute.

On admission fluctuation was made out in the area of a large scar over the deltoid, extending under the latissimus dorsi and into the antero-axillary area. No fluctuation was found in the region of the anterior scar. White blood count, 15,300; temperature, 104; pulse, 108; respiration, 20. Incision into scar released about 2 ounces of bloody pus. A culture and smear of pus was made. Carrel-Dakin technique was instituted. Improvement was rapid and continuous. After a week fluctuation appeared in the region of the anterior scar. Incision here released about half ounce of pus, after which the patient's temperature became normal and remained so. The culture was reported positive for a gram negative bacillus, probably *B. mallei.* He was continued under treatment with Dakin's solution, heat, and rest in bed. The discharge rapidly diminished and the sinuses healed completely. The guinea pig inoculation with culture of *B. mallei* obtained from the pus developed typical lesions of glanders in testicles.

Bacteriological report.—All cultures inoculated with pus from the wound showed a gram negative bacillus in almost pure culture. This organism was nonmotile, nonacid fast, did not liquefy gelatin, or produce gas in glucose or any of the sugars. The brownish growth on potato was characteristic of *B. mallei.* A male guinea pig inoculated intraperitoneally with 5 c. c. of a 24-hour broth culture showed at the end of 10 days the typical ulceration of the testicles. Cultures of the pus from these ulcerations recovered the same gram negative bacilli. Complete fixation tests were not done.

This organism does not seem to be very virulent inasmuch as the guinea pig did not die at the end of about two weeks as was expected, but the ulceration on the testicles healed slowly and at the end of six weeks the pig was in apparently normal condition.

Summary.—This case seems to have been one of infection with a relatively avirulent *B. mallei;* the original focus, a bullet wound, having been healed for several years before the osteomyelitis that it caused gave symptoms calling for medical attention.

ACUTE APPENDICITIS WITHIN A HERNIA SAC.

By C. B. Van Gaasbeek, Lieutenant, Medical Corps, United States Navy.

The following occurrence of acute appendicitis within a hernia sac is deemed of sufficient rarity and interest to warrant the reporting of the case. Although it is not at all uncommon to find

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the appendix and cecum present in the sac of right-sided inguinal hernias, especially those very large hernias of long duration, nevertheless, it is uncommon to find the appendix acutely inflamed and causing symptoms similar to those of an ordinary incarcerated hernia.

Case: Mr. I. E., aged 40 years, single, grocer by trade, stated on July 22, 1923, that for the past 10 years he had had a hernia which could be reduced and retained by a truss. Three days previously he had attempted to lift a heavy barrel. While engaged in this act he felt something give way and his hernia came down farther than it had ever come before and he could not reduce it. Within a few hours he had a sickening pain located over the neck of the sac, felt feverish, was nauseated, and vomited. During the interval of three days he suffered more or less pain and fever, and finally sought aid.

Physical examination was negative except for the hernia. It was a complete right inguinal hernia, the size of a large grapefruit, hard and somewhat dull to percussion. The mass was tender over the internal ring and could not be reduced by taxis. There was slight tenderness across the entire lower abdomen, but there was no pain or tenderness over McBurney's point and no right rectus rigidity. Temperature was 99° and pulse 88. Diagnosis of incarcerated hernia was made.

Operation 40 hours later disclosed a large right indirect inguinal hernia, incarcerated at the internal ring. The sac contained ileum, cecum, appendix, and part of the ascending colon. The appendix was kinked upon itself, swollen, injected, and friable, and attached to the neck of the sac. The upper part of the hernia was of the sliding variety, with the meso-appendix continuous with the wall of the sac.

The appendix was removed and the stump buried and the usual radical repair of the hernia performed. Convalescence was uneventful, and the patient left the hospital 21 days after the operation, completely cured.

In this case, although there was an incarceration of the hernia, and that together with the trauma the probable cause of the appendicitis, nevertheless the pathology present in the appendix was undoubtedly the major factor in producing his symptoms.

CHANCRE OF THE PALMAR SURFACE OF THE HAND.

By J. E. Root, Jr., Lieutenant (j. g.), Medical Corps, United States Navy.

The patient, age 27, single, white, was admitted to the United States naval hospital, Norfolk, Va., August 11, 1923, chief complaint being " ulcer of right hand."

Digitized by Google Original from UNIVERSITY OF MICHIGAN



CHANCRE OF HAND.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

His present illness began about eight weeks ago with a blister on the palmar surface of the right hand at the base of the middle finger. This was caused by cranking a car. The blister disappeared in about seven days. About three weeks later the patient noticed a swelling and hardness at the base of the right middle finger on palmar surface of hand where the blister had been located. This swelling was first thought to be a corn. A few days later this area was incised and a small amount of seropurulent material was evacuated. Alcohol dressings were applied for several days but the wound would not heal and a slowly spreading ulcer developed.

Examination on August 11, 1923: Patient well nourished, weight 150, heart and chest negative; gastro-intestinal, genito-urinary, and nervous system negative. No scars on penis or other evidence of venereal disease. On the right hand there is an ulcer about the size of a dime, at the base of the middle finger, palmar surface. The ulcer is indurated, the induration being rounded, thin, and circumscribed, slightly elevated above the surface, which is eroded and smooth. The color is "raw meat" red. There is no pain in connection with lesion. There is also a triangular ulcerated area on the proximal side of the round ulcer. On August 18, 1923, when the accompanying photograph was taken, the two ulcers had formed into one, about the size of a 25-cent piece. The right forearm from just below the elbow to the upper third of the arm is red and swollen. There is adenopathy in the cubital fossa and lymphangitis of the medial side of the arm. There is no glandular involvement elsewhere.

The dark field examination for *Treponema pallidum* was negative on August 9, 1923, but the Wassermann was strongly positive. On August 13, 1923, another dark field examination was made, which was positive for *Treponema pallidum*. The first negative result was probably due to the fact that alcohol dressings were used for several days. In the interval between the dark field examinations normal saline dressings were employed.

From the above history, examination, and laboratory report, a diagnosis of syphilis was made, the initial lesion being a chancre of the right hand, at the base of the right middle finger, palmar surface. The source of infection is unknown. The condition responded promptly to antisyphilitic treatment.

REPORT OF A CASE OF RECURRENT DIFFUSE SCLERODERMA.

By C. W. Lane, Lieutenant, Medical Corps, United States Navy.

Scleroderma is defined as a rare, chronic disease, characterized by a peculiar hard, leather-like condition of the skin occurring in sharply circumscribed patches or in diffuse areas. The circumscribed

Digitized by Google Original from UNIVERSITY OF MICHIGAN

form is the type generally found, and is also called morphea. This disease is more often seen in females than males and the diffuse form is quite rare.

Diffuse scleroderma begins either acutely or insidiously with slight stiffness of the skin, which usually presents a certain amount of swelling and hardness. Prodromal symptoms of any kind are generally wanting. Gradually, the induration and stiffness of the skin spread over large areas, and occasional cases have been reported where practically the entire surface has become involved.

There appears to be a substitution in the subcutaneous tissue of fibrous tissue for fat. The patient feels a decided tension to the integument, and generally the function of the glands in the skin is checked. The skin is decidedly inelastic. Movement becomes restricted when the skin about the various joints is affected. The face is expressionless, motionless as if covered with a mask, and the mouth opens with some difficulty and to a very limited degree only. Respiration is impeded, if the skin over the thorax is attacked.

Complications are atrophy of muscles from disuse; ulcerations over joints due to stretching of an inelastic skin and consequent pressure; abscess from infection; claw fingers; and there may be actual ankylosis of joints.

Nothing is definitely known as to the etiology. Lewin and Heller collected 435 cases in all and found that 292, or 67 per cent, were in women. Some think the thyroid is at fault. Some have noted a positive Wassermann in a small number of cases; while some hold to a conviction that the condition is a trophoneurosis. This latter view seems most logical. Diffuse scleroderma is quite rare in the Tropics.

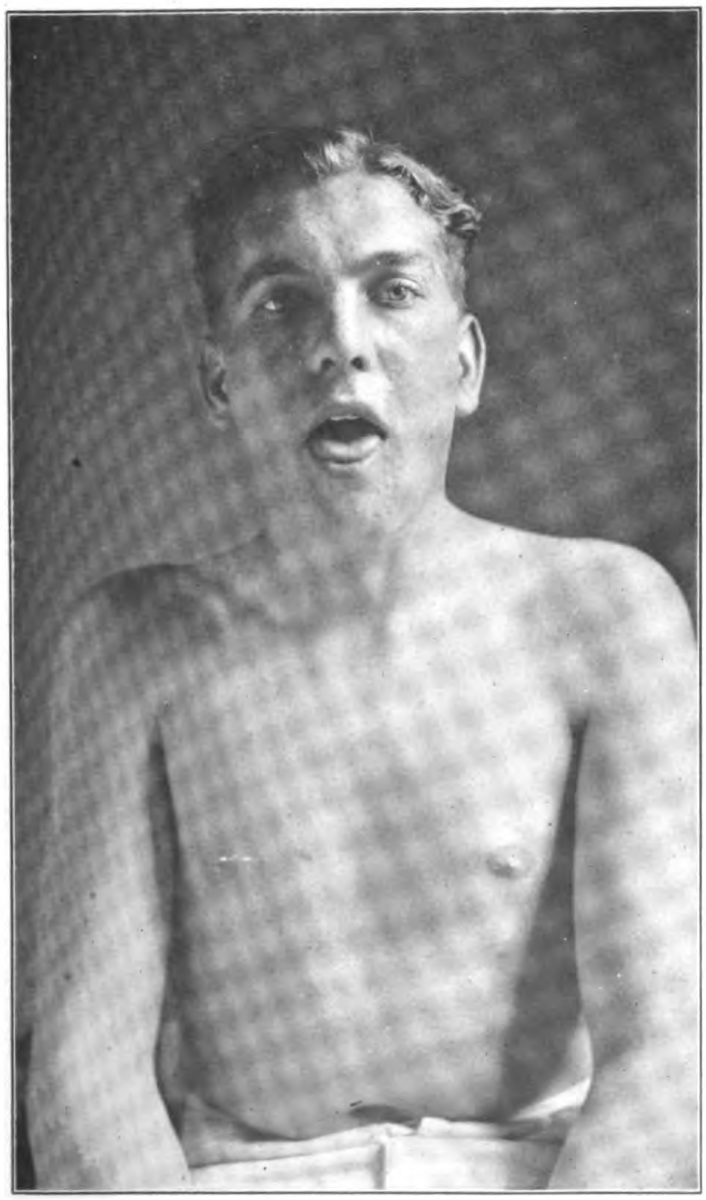
Prognosis.—Unfavorable. The disease may last for years and gradually clear up. These patients are a ready prey to infectious diseases and may be carried off in this manner. Frequently, if the disease subsides, atrophy of muscles is so pronounced that a very prolonged convalescence is in order. Contractures and ankyloses are not infrequent. A contusion may lead to an abscess which may be fatal. In the cases collected by Lewin and Heller, a cure took place in 16 per cent, improvement in 30 per cent, and death in 25 per cent. The balance were considered unimproved.

Treatment.—First, steps are taken to improve general health. Good readily digested food that will form fats is indicated, as are proper clothing to protect the patient from sudden changes in temperature, hydrotherapy, electrotherapy, administration of thyroid extract, and sodium iodide in large doses.

The case here reported is a particularly interesting one.

The patient, a male, age 19, was admitted to the naval hospital, League Island, Pa., April 30, 1923, with a diagnosis of myositis, acute.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

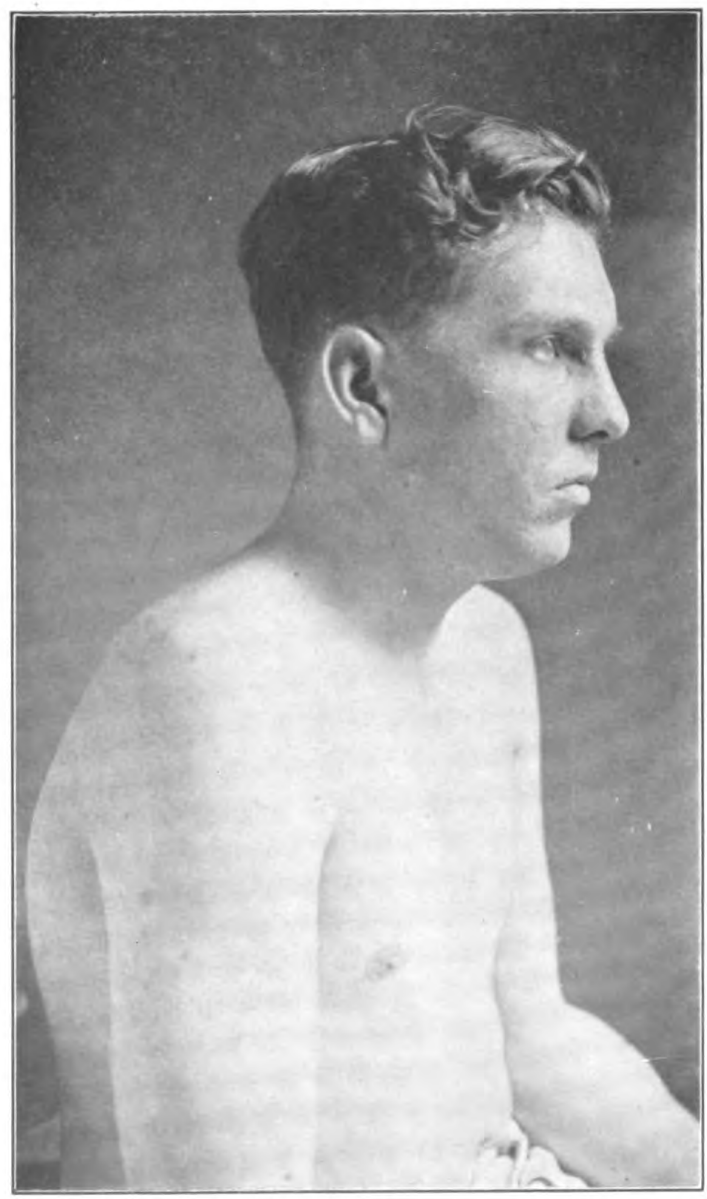


DIFFUSE SCLERODERMA SHOWING RIGIDITY OF FACE.

46—1

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



DIFFUSE SCLERODERMA SHOWING EXPRESSIONLESS FACE AND ROUNDED SHOULDERS.

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

Nativity, United States. Race, white. Former occupation, bank clerk. Date enlisted, September 20, 1922.

Family history.—Father living and well. Mother living, but has diabetes. No history of any chronic illness except as mentioned. No history of any scleroderma in family.

Past personal history.—Measles, mumps, and chicken pox when a child. Tonsillitis, December, 1922. Operation: Compound fracture left ulna when 6 years old. At the same age he also had adenoidectomy and tonsillectomy.

Chief complaint.—Stiffness of body.

History of present illness.—The patient stated that when he was a child he had a similar trouble and upon communicating with his family physician, we received the following reply: "According to my records, young "B" at the age of about 6 years received a fracture in the upper third of the ulna with a misplaced fragment that had to be compounded for reduction. He had been a healthy child from birth until this time; had no complications at birth. A short while after the healing of his fracture, he showed the first symptoms of his scleroderma which at that time was in his cheeks, but within 60 days had spread over his entire body. It was my opinion that it was from toxin following his compound fracture which showed no infection at the time. At that time we advised his mother to take him to a higher and drier climate and put him on graduated doses of sodium iodide. We gave the mother a very unfavorable prognosis. I have no record of this treatment, but think the iodides were extended to something like a dram a day, which was enormous for this youngster. To our surprise, he seemingly made a complete recovery."

The patient states that he fully recovered and enjoyed good health. When he enlisted in the Navy, he was apparently in excellent health, and there was no evidence of scleroderma objectively or subjectively.

The first part of December, 1922, he had a slight sore throat, which was probably a mild attack of tonsillitis, but he did not feel ill enough to turn in. December 20, he went on leave and first noticed stiffness of his abdominal muscles about that time. About 10 days later his neck became stiff, and this stiffness and tight sensation progressed gradually until practically his entire integument was involved. It was then that he was admitted as a patient to this hospital. He never had any edema preceding or accompanying this attack. There was no pain and there was practically no pigmentation.

He felt well on admission, but was uncomfortable and complained chiefly of slight repiratory difficulty, as his chest seemed immovable and felt as if it were held in a vise. His face was expressionless and masklike; he could open his mouth part way but could not pro-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

trude his tongue beyond the teeth. His face on palpation felt hard and highly resistant everywhere. His eyes could not be widely opened, although the lids were not as involved as the rest of the face. This leatherlike hardness and inelasticity of the skin was found over his entire body with the exception of the inner surface of both thighs and the genitals. The palms of the hands and soles of the feet were involved, but to a much less degree. The skin was dry; there was no scaling or pitting; there were no areas of anesthesia or hyperesthesia or edema. The skin could not be pinched up into folds, but seemed firmly adherent to the musculature immediately beneath it. The color and capillary circulation were apparently unchanged. The head was held in one position and could be moved about only with exertion. The chest was drawn in and seemed quite rigid, and this gave him a decided " round shouldered " appearance. The arms could not be abducted above the shoulder level. There was resistance to any motion attempted, and the skin seemed tight over all joint surfaces. He perspired very little except from the palms of his hands and soles of his feet and the inner aspect of his thighs and over the lower lumbar region. These localities were the least affected by the pathological condition.

Mentally, he was not affected, and the remainder of his physical examination was negative.

Blood, Wassermann negative. Absolutely no history of syphilis. Blood pressure: Systolic, 116; diastolic, 60. Thyroid showed no changes. Hemoglobin, 80 per cent; R. B. C., 3,320,000; W. B. C., 6,150; 61 per cent polys.; 36 per cent lymphocytes; 3 per cent large mononuclears and transitionals. Feces was negative for parasites, ova, or blood upon several examinations. Urine was normal.

He has not noted any definite loss in weight. His temperature, pulse, and respiration show no variation from normal.

He was placed on a substantial diet plus cod liver oil emulsion and local inunctions of olive oil. Later, he was given thyroid extract, but it seemed to have no bearing on the progress of the case.

In June, he was given hydrotherapy and electrotherapy and it appears that the latter helped him some. It was noted that the skin over the thighs (outer portion) and the skin over the back recovered some of its elastic quality and softened and he perspired over a larger area than previously.

Sodium iodide up to 110 grains a day was given, but the patient noted very little improvement. He was invalided from the United States Naval Service July 18, 1923. Several weeks later a letter was received from him stating that he noted no improvement up to that time.

It will be noted that at about the time he had his first attack he had a tonsillectomy. A definite history of tonsillitis could not be

Digitized by Google Original from UNIVERSITY OF MICHIGAN

obtained, and the patient could not recall whether this preceded, accompanied, or followed his scleroderma. He gives a definite history of sore throat with perhaps slight fever immediately preceding his second attack. He has tonsil stumps and it is possible that the etiological factor lies there. He did not wish tonsillectomy, and from the appearance of the throat the tonsils did not depict a definite focus.

This case is of special interest in view of the fact that diffuse generalized scleroderma is rare and very seldom affects the palms of the hands and soles of the feet; and more interest is added by the fact that it is a recurrence or complete new cycle after a period of 13 years, during which interval the patient had no symptoms of the disease and enjoyed perfect health.

The illustrations show the patient with mouth as widely opened as possible, with the tongue protruded as far as teeth. They also show the " round shouldered " vise-like position of the chest.

A CASE OF ACUTE YELLOW ATROPHY OF LIVER.

By G. L. McCLINTOCK, Lieutenant, Medical Corps, United States Navy.

H. F. C., machinist's mate, first-class, United States Navy, was admitted to the hospital December, 30, 1922, with primary lues. A dark field examination was positive for *Treponema pallidum*. The patient was given small doses of salvarsan. He was discharged as improved January 16, 1923, the primary lesion having healed. Mercury rubs were instituted. On January 31, 1923, he was readmitted, with the diagnosis cholangitis acute. Jaundice was pronounced. Antiluetic treatment was discontinued. A complete physical examination showed the patient also to have bilateral active pulmonary tuberculosis. The sputum contained numerous tubercle bacilli at each examination. Traces of albumin and occasional granular and hyaline casts were found in the urine. Indican was found in one specimen and bile was present in all specimens examined. Specific gravity of the urine ranged from 1.009 to 1.027. Blood examination showed hemoglobin 70 per cent, anticomplementary to Wassermann test. Blood chemistry in milligrams per 100 mils was as follows: Nonprotein nitrogen, 34.3; urea nitrogen, 11.2; urea, 24.0; uric acid, 3.0; creatinin, 1.8; and glucose, 98.6. Feces examination was negative. The patient's temperature ranged from 97° to 99° to the day of his death, when it was 101°. Pulse and respiration were normal until just prior to death. The jaundice was at first thought to be due to salvarsan; but as the patient developed intense nausea and vomiting, and as the jaundice deepened, he became progressively worse in spite of all dietetic and therapeutic measures used for his relief. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

condition was believed due to acute yellow atrophy of liver. Death occurred February 11, 1923.

Autopsy findings (*only pertinent findings are recorded*).—Body embalmed 36 hours prior to autopsy. Entire body had a distinct greenish color, due to the action of embalming fluid on extremely jaundiced tissues.

Pleuria, both cavities completely obliterated by firm adhesions and in the right these adhesions were considerably calcified.

Lymph nodes, none enlarged, firm but not necrotic.

Lung, tuberculous cavitation extensive in both apices, few scattered tubercles in rest of lung.

Liver, small, capsule smooth, and in many areas the tissue beneath showed green. The organ was sectioned throughout and the cut surfaces all showed extensive green and gray areas, the green occurring in strands as if in the bile ducts, the liver tissue between being gray. Where the liver was more normal in appearance and light brown in color the markings were obscured. There did not appear to be any cirrhosis, congestion, or infected foci. The gall bladder contained about 10 c. c. of mucoid bile and the ducts were patent.

Spleen, of moderate size, capsule slightly thickened, pulp dark red in color.

Kidneys, large, swollen, congested organs, capsules stripped readily; cortices greatly swollen and the architecture was much obscured. Vessels and ureters normal.

Stomach and intestines, the stomach contained about 150 c. c. of fluid and semifluid material of coffee-ground appearance. The rest of the intestinal tract contained blood-stained material, and in the colon, sigmoid, and rectum were fluid and coagulated blood in large quantities. The gastric mucosa appeared normal, and the rest of the tract presented a much injected and generally deep red mucosa, most marked in the colon. Evidently there had been extensive ecchymosis with considerable escape of blood into the lumen of the bowel, as there were no ulcers and no localized lesion from which the blood could have escaped. The appendix was about 6 cm. long, retrocecal and lightly bound; normal.

Frozen section of liver showed all degrees of necrosis present with some attempt at replacement; many small, dark, nucleated cells present. No staining for organisms done.

Weights of organs (*embalmed*).

Liver	grams 1,005	Right lung	grams 1,220
Spleen	do 215	Kidney, right	do 260
Heart	do 345	Kidney, left	do 207
Left lung	do 1,095	Body weight	pounds 129

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Anatomical diagnosis.—Acute yellow atrophy of liver. Tuberculosis, pulmonary. Fibrous pleuritis. Congested spleen. Parenchymatous nephritis acute. Congestion and ecchymosis of intestine and hemorrhage into lumen. Secondary syphilis from history.

Cause of death.—Acute yellow atrophy of liver.

Contributary cause.—Syphilis, secondary; tuberculosis, pulmonary.

G. Lepehue (1) in a discussion of the etiology of this disease says: "Nothing positive can be said. E. Frankel in a case of jaundice with hemorrhagic enteritis demonstrated a cholangitis caused by a parasitic typhoid bacillus in the walls of the gall bladder and bile duct; injection of the patient's serum into a guinea pig resulted in the same clinical picture. Fermentive autolysis of the liver cells is the assumed immediate cause of atrophy of liver. Solomom suggests this is due to absorption of a pancreatic ferment. Pick and Hashimoto proved by chemical tests the occurrence of autolysis in a guinea pig following the giving of small doses of albumin. They also showed that this did not occur in the guinea pig when the spleen had been previously extirpated. Other investigators have shown that necrosis of liver cells subsequent to chloroform poisoning or injection of hemolytic sera could be prevented by extirpation of the spleen. Eppinger removed the spleen in three patients; one quickly recovered from the operation with the icterus cured, the other two died shortly after operation."

W. Hayashi and T. Kibata (2) report a typical case of yellow atrophy in which they found a species of spirochete in the liver and other affected organs. Long threadlike organisms, 10 to 12 microns in length, in necrotic area in the intestines. In the liver similar organisms, and in addition numerous small bodies, diphtheroid or diplococcoid in type. In the kidney, in addition to the two types found in the liver, there were present a spiral organism in the neurotic epithelium of the tubules. In the pancreas coccoid bodies, some of which were elongated, approached the threadlike forms found in the liver. The occurrence of two or more chromatic spots and positive reaction to the Levaditi method would seem to indicate the coccoid body is not a bacterium. These authors think the three bodies described represent the stages in the life cycle of a single species of organism, namely, a spirochete.

Icterus development during the treatment of syphilis is rather uncommon and Bodin (3) thinks it is due to variation in toxicity in the various lots. In a series of 254 cases, icterus developed in 0.78 of 1 per cent; in a second series, icterus in 1.77 per cent, whereas in 472 cases, the third series, there were 7 per cent of the cases icterus. In these three series different lots of arsephenamine were used.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Of special interest to this case is one reported by Ravant (4). Impressed by the argument of Milan that icterus developing in syphilis is more likely due to the disease than to the arsephenamine, Ravant resumed treatment in a case of iterus that had developed two months after cessation of arsephenamine therapy. This resumption of treatment led to icterus gravis and death. On autopsy there was evidence of syphilitic lesion of the liver. The author thinks the patient died of toxic hepatitis. (It is regrettable that a fuller autopsy report of this case is not available.)

In this case the immediate cause of death—acute yellow atrophy of liver—was in all probability due to a toxic condition due to pulmonary tuberculosis, lues, and probably in an indirect way the Salvarsan received.

REFERENCES.

1. Duetsch. Med. Wchnschr., July 14, 1921.
2. Jour. Infect. Dis., January, 1922. Practical Med. Series, vol. 1, 1922.
3. Bull. Soc. franc. de dermat. et syph., No. 6, 1921.
4. *Ibid.*, No. 2, 1921. Practical Med. Series, vol. VII, 1921.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS.

MEETING OF THE ASSOCIATION OF MILITARY SURGEONS.

The annual meeting of the Association of Military Surgeons was held at the United States Army Medical Field Service School, Carlisle, Pa., October 4–6, 1923. The rotation of office of president provides for the administration of the association each year by a representative of the Army, Navy, Public Health, or National Guard. The meeting at Washington, October, 1922, was essentially naval, with Capt. F. L. Pleadwell, Medical Corps, United States Navy, presiding. It was to be expected, therefore, that this year, with Col. Charles Lynch, of the Medical Corps of the Army, president, the duties of medical officers with troops would be emphasized. Such was the program in general, but for us of the Navy it was an excellent demonstration of the importance of training civilian doctors to render them more efficient as military surgeons on an active or reserve status. The Medical Department of the Army fully realizes that in times of peace a "skeleton" organization must be maintained with provision for expansion in time of war to perhaps 30,000 medical officers. To accomplish this mission a comprehensive program of organization and training of a large Reserve Corps was instituted. Medical officers entering the active corps are given a four months' course at the Field Service School before they are sent to the Army Medical School in Washington. The course for the reserve officers and those from the National Guard is of six weeks' duration, supplementing a correspondence course or graded instruction in class A medical schools. At present in the R. O. T. C. units there are basic and advanced courses in 24 medical, 6 dental, and 4 veterinary schools. At the end of the two years' basic course the student has an opportunity to join the Reserve Corps, and during the two years of the advanced course receives as emolument the value of a commuted ration. On graduation he is also offered an internship in the Army Hospital with commission and opportunity at the end of this service to enter the Medical Corps of the Army. It is believed that this training of students provides for a valuable method of recruiting the Medical Corps for active or reserve duty.

An important feature of the Carlisle meeting was the development of the fraternal spirit of the organization. This was accomplished by having the delegates and members quartered in the officers' homes

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

or at the post club. Informally at meals and at the several social events there was abundant opportunity to discuss and hear of the work of the different services. This association is the one organization in which military surgeons can meet on a common platform to promote fellowship and coordination of effort. Delegates and members who attend the Carlisle meeting were fully impressed with the value of membership to every medical officer, whether in Army, Navy, Public Health, Reserves, or National Guard.

The practical demonstrations given at this Field Service School can not always be a feature of every annual meeting, but it was evident that they are very desirable. It was also the expressed opinion that articles in the journal should always be on military-medical subjects. Many members who can not attend the annual meetings keep in touch with the other branches of the service through the medium of this journal. Those of us in the Navy have our Medical Bulletin for timely information, and also see the Public Health reports. The military surgeon's magazine is the principal source of information concerning recent advances in the Army Medical Department. The by-laws of the association provide for a literary committee composed of members from each branch of the service. It is believed that the success of the association depends to a great degree on maintaining this committee, and if possible every number of the magazine should include articles concerning the work of each service.

The value of membership is not appreciated by many medical officers in the Navy, largely because they are not informed of the aim and object of the association. At present we have 184 members, of which 86 are in the active corps and 98 in the reserve or retired. By reading the by-laws one can readily decide if he considers it worth while and also his duty to support a society that endeavors to promote the greater efficiency of all military surgeons of the United States. The cost of membership is very little and the annual dues a nominal sum ($1). The military surgeon is to-day a specialist more than ever before, and to maintain this specialty it is necessary to keep informed on many subjects. In time of war we must serve together and coordinate our work, hence mutual understanding is a necessity. History is full of the records of joint campaigns where cooperation has failed. The success of our transport operations during the recent war depended on a close liaison with the Army Medical Department. The value of the expert knowledge of Public Health officers was shown when we utilized their services in every naval district.

The program of this thirty-first annual meeting at Carlisle was as follows:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

OCTOBER 4.

First session, 9.30 a. m.

Business meeting (for members only).
Reports of—
- **Executive committee.**
- **Secretary-treasurer.**
- **Boards of award.**
- **Necrology committee.**

Appointment of—
- **Nominating committee.**
- **Auditing committee.**
- **Committee on resolutions.**

Miscellaneous business.

Second session, 10.15 a. m.

General meeting.
Music.
1. **Address of welcome. Lieut. Col. Charles R. Reynolds, M. C., United States Army, commandant Medical Field Service School.**
2. **Address of the president. Col. Charles Lynch, M. C., United States Army.**
3. **Presentation of badges of honorary membership to foreign delegates. Maj. E. E. Hume, M. C., secretary,**
4. **Addresses by Maj. Gen. Merritte W. Ireland, Surgeon General, United States Army; Rear Admiral E. R. Stitt, Surgeon General, United States Navy; Surg. Gen. H. S. Cumming, United States Public Health Service.**

Music.

5. **Addresses. General organization of the treatment and evacuation of wounded with fractures in the area of the front. Le médécin principal de 1ère classe Duguet, l'Armée Francaise, professeur a Val-de-Grace.**
 - **(*a*) Statistical data relating to the French Medical Service during the war 1914–1918.**
 - **(*b*) Organization of the French Medical Service during the operations of August, 1917, at Verdun; historical account. Le médécin principal de 1ère classe Visbecq, médécin chef de la section technique du service de santé l'Armée Francaise.**

Third session, 1 p. m.

Demonstration of new equipment for medical troops and units. On the athletic field.
Inspection of Medical Field Service School.
5 p. m. Parade and review.
Unveiling of bronze tablet commemorating the services of officers, nurses, and enlisted men of Medical Department who lost their lives during the World War. Brig. Gen. John M. T. Finney, Medical Officers' Reserve Corps.
9 p. m. Reception and dance, post gymnasium.

OCTOBER 5.

Fourth session, 8.20 a. m.

All-day demonstration of lines of medical aid from the firing line back to and including the field hospital.
Chemical-warfare demonstration.
8.30 p. m. Smoker, post gymnasium.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

OCTOBER 6.

Fifth session, 9.30 a. m.

1. Report of auditing committee.
2. Report of committee on resolutions.
3. Report of nominating committee.
4. Election and installation of officers.
5. Unfinished business.

Adjournment.

12.30 p. m. Visit to the Gettysburg Battle Field.

It will be noted that the only papers presented were by two French medical officers. The one on statistical data and the organization of the French medical service during the World War was especially of interest and will appear in the Journal. It is well for members to realize that because of the practical features of this meeting there were not the usual number of papers. Throughout the coming year loyal support by the association can be shown by contribution of articles on the various activities of the corps. Although we must maintain the efficiency of our own Bulletin, yet there are certain papers more suitable for the association journal and no doubt would be welcomed by the editor, Maj. E. E. Hume, secretary and treasurer, United States Army Medical Museum, Washington, D. C.

During the third session of the meeting a demonstration of new equipment included several units of special interest to the Naval Medical Department. A modified Stokes splint stretcher for aviation service and trench warfare has the advantage of being lighter, but the removal of support for the feet places the strain of the patient's weight on his perineum. A "combat" wagon has been evolved by Major Fletcher, attached to the school, and will be a valuable addition for the medical battalion with the marines. It can carry the equipment of a battalion aid station or two field litters and also transport 14 men, 6 on each side and 2 in front. If the equipment is not carried, then two additional litters may be transported. This wagon has rubber-tired wheels of the same standard size, is animal drawn for use at the front, and has greater security in turning than the present escort wagon. A "Delco" lighting unit for the field hospital was shown. This year during the marine maneuvers the medical battalion had a smaller "Delco" unit for the field hospital section and it proved to be satisfactory. Major Fletcher has also devised a new model of field kitchen that is lighter and better than the one in general use. A field hospital tent was shown that has certain features that make it worthy of consideration for use for an advanced base hospital. It will provide shelter for nearly twice as many patients as a standard Alladin "knock-down" building, and the weight and space occupied is much

Digitized by Google Original from UNIVERSITY OF MICHIGAN

less. The cost is about the same. It is provided with windows, has a "ceiling cloth" to render it cooler in summer, and the roof beam has lateral supports instead of center poles. Last winter the weatherproofing of the canvas was thoroughly tested and found satisfactory. An inspection of the Medical Field Service School followed the demonstration of equipment. The tactical room contained models of the terrain about Carlisle so that problems could be studied indoors. In the section where field sanitation and hygiene are taught there are models of the various types of incinerators, latrines, fly trap, etc., to demonstrate the accepted methods in use. Several of our naval medical officers have availed themselves of the opportunity to take this course at Carlisle and found it very profitable.

The all-day demonstration of the lines of medical aid from the firing line to and including the field hospital was an indication of the detail involved in solving the problems of evacuation of wounded. Automobiles and ambulances transported the members of the association to the selected terrain and the problem was given to each of us in order that we might follow the solution. Each unit was equipped as it would be in action, and treated cases with simulated wounds. At noon, upon arrival at the collecting station and ambulance "head," we were given a field luncheon from a "rolling" kitchen. A critique of the problem solved by the staff of the school was then conducted, after which we returned to the barracks and inspected the field hospital.

The chemical warfare demonstration illustrated the conditions we must experience if the nations which did not sign the Washington agreement should utilize gas and chemicals in warfare. Nontoxic smokes were principally exhibited, but a lachrymatory gas was included that gave a touch of reality. In naval warfare there will be problems for us to solve if such chemicals are ever used, and therefore every naval medical officer should have a knowledge of these "gases" and the methods of protection and treatment.

Following a parade and review of the student officers and Hospital Corps personnel, a bronze tablet was unveiled commemorating the services of officers, nurses, and enlisted men of the Medical Department of the Army who lost their lives during the World War. Brig. Gen. John M. J. Finney, Medical Officers' Reserve Corps, and professor of surgery at Johns Hopkins, delivered a stirring oration in which he eulogized the devotion and service of those who had died.

The final business meeting and election of officers for the coming year was held on October 6, after which the battlefield of Gettysburg was visited and the positions of the contending troops designated. It was the unanimous opinion that this Carlisle meeting

Digitized by Google Original from UNIVERSITY OF MICHIGAN

was one of the most instructive and satisfactory ever held, and returning delegates were fully impressed with the value of membership.

THE PROTECTION OF CAPITAL SHIPS AGAINST POISON GAS.

It has been said that throughout the whole history of warfare, no weapon that had once proved to be successful had ever been abandoned so long as it continued to be efficient. Chemical Warfare, a magazine devoted to the activities of the Chemical Warfare Service of the Army, in its September, 1923, issue recalls the fact that only eight years have passed since chemical warfare was introduced. This method of combat proved successful, and consequently it will be used in future wars. The armies and navies of the world have recognized the efficiency of this comparatively new weapon. They realize that to be safe in the event of future wars, a knowledge of chemical warfare and how to protect against it must not be neglected.

In this connection the following article on "The protection of capital ships against poison gas," by Lieut. Paul W. Hains, Construction Corps, United States Navy, originally appearing in the United States Naval Institute Proceedings of July, 1923, is of interest to naval medical officers.

"In 1917, during an action between German and British destroyers off the Belgian coast, the Germans laid down what appeared to be an ordinary smoke screen through which it was necessary for the English ships to proceed. Their flotilla leader, the *Botha*, had no sooner entered than her crew were overcome—the Germans had mixed in poison gas, or, more correctly speaking, toxic smoke of some kind. Entirely unprotected against such a weapon, the English suffered badly; and although the *Botha* passed entirely through the smoke screen in about a minute, in that short time every man on the ship was thrown into paroxysms of nausea and suffered a most violent headache, even for some time after.

"It is not reported whether or not the Germans were victorious as a result of their using toxic smoke, nor is this information important for our present purpose. The point to note is that poison gas has been used in at least one naval battle. And it can be used in other ways than by being mixed with a smoke screen. It can be dropped from airplanes in bombs; it can be projected upon an enemy in shells; it can be strewn in the path of an oncoming enemy by using floating containers which may be set off by a time fuse and which do not explode but emit the deadly gas slowly over a period of five minutes; it can be dropped from the stern of a retreating fleet to prevent pursuit; it can be sprayed from airplanes flying at low altitude far enough ahead of an enemy's fleet to be out of danger from

Digitized by Google Original from UNIVERSITY OF MICHIGAN

gunfire and yet close enough for the spray to settle to the surface of the water just as the enemy reaches that point. Other means may be developed by foreign countries about which to-day we know nothing.

"And if poison gas can be used to work havoc upon an enemy's fleet, it will be so used. The United States Navy can not afford to sit back in complacency, secure in the knowledge that the Washington Peace Conference has abolished the use of gas in war. Actual gas protection must be provided our ships, in addition to the potential protection they now have. History has shown too often the impotency of an agreement, written or understood, when some nation's desires are thwarted by that agreement. When that nation, with whom we may be at war, believes that it can bend us to his will by using poison gas on our naval forces, it may help us little to recall to his mind an old agreement not to use gas. What we will need then is protection, positive and actual. Did Belgium fail to build forts around Brussels because Germany had agreed to keep out of Belgium domain? No, and the world is thankful. And that is the risk also that we can not take. Of what then does the ideal protection for our Navy consist? It will be attempted only to describe a system for our battleships. With modifications, the system can be applied to the other types of ships in the service. Our fundamental requirement is that every man on the ship should be provided with and drilled in the use of a gas mask. There should be provided for men doing manual labor the type now found on certain battleships, having the canister carried on the wearer's head so as to permit free motion of the arms. Men who are required to speak in the performance of their duties should be provided with a diaphragm mask. Men wearing telephones should have an adapter to fit over the mouthpiece of the telephone and the diaphragm of their mask. No separate 'telephone' mask is seriously needed. There should be provided what might be called an 'optical' mask to be used by men required to sight the enemy. Pointers, trainers, range-finder men, spotters, turret officers, etc., require this type. The mask should invariably be made an integral part of the sighting instrument, the eye-pieces of the mask and of the instrument being combined into one piece. The canister should be carried on the optical instrument, so that the gas mask would be in all respects a part of the instrument. The angle tube of the mask should be fitted with a two-way valve, the manipulation of which should permit the wearer to breathe either directly from the atmosphere or through the canister, as necessity required. The advantages of this mask are twofold. First, the wearer would become highly efficient in its use, because he would

Digitized by Google Original from UNIVERSITY OF MICHIGAN

have to use it at every drill. Second, at a time of battle when a gas attack is expected, there would have to be no cessation in his duties—no need of taking his eye from the instrument, putting on and adjusting a gas mask, and then again picking up the enemy. Officers appreciate the difficulties of spotting, training, etc., under the most normal conditions. Imagine the multiplication of these difficulties when wearing a cumbersome gas mask which is not attached integrally to the telescope. Finally a combination of diaphragm and optical mask should be provided for spotters, range finders, and fire-control officers. It is believed that these four types of mask fully cover the requirements of the service.

"Not only must every man on board ship have his gas mask, but also he must be provided with protective clothing of some sort, clothing that will protect him against such vesicant fluids as mustard and lewisite. These fluids and their vapors cause no immediate burns when they impinge upon the skin, and often require 12 hours or more to produce a casualty, and they therefore probably will never be used in a major engagement where immediate casualties are of more import. Nevertheless, they have an important use in the case of fleets lying at anchor or in the case of detached engagements where warships are used to cover landings or to bombard ports. A case in point occurred at Gallipoli during the World War. There, if the Turks had been able to sprinkle the British ships with mustard, using airplanes for the purpose, the British undertaking would have come to an abrupt halt, for the personnel of the British forces were not protected by impregnated clothing. Every man touched by the liquid would have been incapacitated to some degree. Every deck and every gun that had been bathed with the chemical would have been out of commission for days, because of the horrible burns that would have resulted from walking on the one or manipulating the other. And another case is that of the use of mustard gas by the Germans on the British fleet in Scapa Flow. Such a blow would have given the German fleet immediate superiority on the high seas—their enemy being reduced from the mighty British armada to the few ships that probably would have escaped the deluge of mustard.

"The need for protective clothing is there. Then the question is, Should the clothing be a separate article for war only at battle stations, or should it consist of a set of underclothing, shoes, socks, trousers, and blouses to be worn always when, in war, the fleet is in reasonable danger of being gassed with a vesicant agent? It is believed that the former type is far better suited to the requirements of the service for the following reasons: First, because this hooded over all would be worn only in action and at enough drills to get

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the 'feel' of them, and would therefore outlast the other type, which would very likely be worn at any old time the owner found his clean laundry supply getting low. Although impregnated clothing can be laundered, the process after a few washings seriously reduces the protection the clothing can give against vesicant agents. Second, because it is easy for a divisional officer to see at once if his men are wearing protective clothing when a battle is imminent and if they are not doing so to enforce the rule. It would be far from a simple matter to inspect each man's undershirt and socks before going into action to see that he was properly gowned with the correct set. And this matter can not be left to the men themselves. Their contempt for such a suit of clothing would be only too marked. Due to their ignorance regarding the horrible burns that occur when mustard gas or lewisite gets on a man's body, they would be prone to go into action as they felt most comfortable; and 'damn the torpedoes—we'll take our chances with mustard.' The hooded over all is a veritable signal that shows the desired information. With the ordinary clothing impregnated, an officer would have to content himself with warning his men that they ought to be wearing their impregnated outfit. And the third reason is that shoes, mittens, hood, and main body covering can be incorporated into one garment, giving complete protection, in the over-all type, whereas, in the other case, separate mittens, shoes, and hood must be on hand. In one case just 1,200 complete suits must be accounted for; in the other case 2,400 shoes, 2,400 mittens, 1,200 trousers, 1,200 shirts, 1,200 hoods, etc., must be looked after at all times in order to have them at hand when needed.

"Although masks and protective clothing should be supplied for all men, the protection they afford should be resorted to only in a case of emergency. Other protection, protection to the compartments themselves, should be provided wherever possible. It is undesirable for men to have to wear their masks because their efficiency is thereby cut down, and especially is this true in the case of men doing manual labor. The mask is cumbersome; it is difficult to breathe through for any length of time; and it produces considerable discomfort from perspiration and body heat. The amount of drop in a man's efficiency is a mooted question, as it is a matter that does not lend itself to accurate calculation. But that there is a drop can not be denied, nor can it be said that it is so small as to be negligible. The writer has played a game of baseball wearing a gas mask, and the heat, difficulty of breathing, and general lack of 'pep' were marked. He has likewise gone to the other extreme of writing while masked; and there also, though in a lesser degree, the same effects were produced. So we say that there is a loss in a man's efficiency. What does this mean on a ship?

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"It means that the rate of fire from the ship is going to be slower, due to the cumulative drop in efficiency throughout the ship. The men in the powder and shell handling rooms do not get the ammunition to the hoists quite so fast; the loaders have just a little more lag in their work; the pointers, trainers, sight setters are all just a little slower at their work; and so on up the line. The result is bound to be felt. And therefore it is entirely reasonable to expect that the fleet which must go into battle with its men gas-masked throughout, against any enemy unmasked but still fully protected, all other things being equal, is going to be defeated.

"The consideration of this additional 'compartment' protection is facilitated by dividing the battle stations on a ship into four types. In the first place there are those battle stations which are fully exposed to any kind of attack, gas included. Signal stations, the gun crews of antiaircraft guns, first-aid parties, and miscellaneous transient personnel fall under this head. Second, there are such spaces, as turrets, secondary batteries, handling rooms, and ammunition passageways all of which may be termed semiclosed, in that, although they are fully protected by armor and are even, some of them, deep in the bowels of the ship, yet they are not air-tight and can not readily be made so, due to the necessary passage of ammunition through them. Third, there are the fully closed spaces, such as steering-engine rooms, central stations, torpedo rooms, switch rooms, sick bays, distribution rooms, and radio rooms. Under this heading also are included fighting tops, conning towers, plotting rooms, and other spaces which, though normally not fully closed, could be made perfectly air-tight, with modifications in their design. The fourth type of space embraces all spaces that have boilers or propelling machinery or its auxiliaries in them, dynamo rooms, and evaporator rooms.

"The personnel in the first, the fully exposed type of battle station, can be given no protection additional to that furnished by their masks and their protective clothing.

"The men in the second type, the semiclosed type of battle station, constitute our hardest problem, and the one most demanding a solution—for these men furnish our offensive power. Briefly stated, the solution offered is this. To close all such spaces as tightly as possible, and to keep them under a small head of air pressure, the air being obtained from some sort of purifier. By keeping these spaces under pressure the contaminated air outside can not get into them. Two subproblems are encountered: First, how to make a turret or a secondary battery tight enough to enable a reasonable-sized blower to keep the space under a few inches head of pressure; and, second, what sort of air purifier is there that will remove chlorcetephenone,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

chlorpicrin, phosgene, or chlorine gas from contaminated air. The complete details of the means by which a secondary battery can be made reasonably air-tight are quite impossible of any considerable amplification without its occupying undue space, but that such is possible we believe. Briefly the proposition would be to isolate each set of two guns in the secondary battery from the rest of the ship by decks or splinter bulkheads pierced only by water-tight doors. Such a scheme (possibly, however, not with the same goal in view) has been used on the Japanese battleship *Mutsu*. The gun ports of course could not be the open type we now have on the *Pennsylvania* and later ships. A development of the old type of sliding shield port would have to be used with, possibly, some sacrifice in resulting arc of train. The gun shield would have to fit the decks and the side of the ship snugly and be fitted with a sort of felt scraper. The opening in the shield for the gun would be closed by a gun buckler of some type and opening for sights minimized to the utmost. Turrets would be made tighter by inserting felt scrapers between the cylindrical-shaped piece now used on the three-gun, 14-inch turrets and the turret front plate; by minimizing the openings for trainers' sights; by closing up completely the fifty-odd 1-inch holes in the overhang; and by providing felt sliding pieces between the barbette and the turret. The suggestions as here offered are crude, but they do point out the general scheme that it would be necessary to follow in order to make these semiclosed spaces tight enough to make possible the maintenance of a few pounds of air pressure within them.

"The pressure required will not be great, just enough to prevent any wind that is likely to be met under battle conditions from blowing the gas into the turret through the few openings that, of necessity, can not be closed. If we assume a maximum wind velocity likely to be met in battle of 25 miles per hour, and a total projected area perpendicular to the wind direction of a few square inches, the necessary pressure within the turret will not be greater than about 8 pounds per square foot; that is, 1½ inches of water. Escape of air through the guns when the breeches are opened would not alter the effectiveness of this scheme of protection because the pressure of the wind outside when high would tend to lower the velocity of air escaping through the guns, and when low would not require such a high pressure as 1½ inches inside the turret to keep the wind out.

"So much for the tightness of semiclosed spaces and the necessary air pressure within them. The next step is to procure a purifier for the ventilating system of such spaces, and for this purpose the Seco spray is recommended. This machine is a product of the Chemical Equipment Co., of Chicago, and finds its use in industry as

Digitized by Google Original from UNIVERSITY OF MICHIGAN

a deodorizer, an evaporator, a gas cooler, a gas absorber, and an air washer. Its essential features are a horizontal revolving disk upon the top of which a liquid is continuously poured and by reason of the whirling motion the liquid is thrown out in a thin sheet or spray. On the underside of the disk are fan blades set at such an angle that any gas which is fed in at the bottom and upward to the middle of the fan is whirled outward into the liquid spray. Surrounding the machine is a metal wall in the shape of a truncated cone. The gas and liquid are intimately mixed during the time of flight from disk to the wall. At the wall they are quickly separated by the action of impinging thereon and the gas passes out at the top and the liquid at the bottom. The machine is simply a mechanical mixer and separator of a liquid and a gas. Now by using the proper alkali solution as the liquid and a given chemical warfare gas it becomes an excellent air purifier suitable for our use in the Navy. A small laboratory machine at Edgewood Arsenal has successfully removed 95 per cent of various poisonous gases from contaminated air. The remaining 5 per cent, it is hoped and fully expected, can be removed by using an auxiliary disk and spray above the main one, all inclosed in the same wall.

"However, since the removal of this last 5 per cent of gas has not crystallized as yet, we will assume that the Seco spray can remove only 95 per cent of the gases. This means that for the few minutes at the most that a ship will be in a gas cloud the concentration necessary to produce lethal or lachrymatory effects in a turret must be twenty times the concentration required if there were no purifier. And such a concentration it is practically, if not absolutely, impossible to produce under 'field' conditions at sea. And thus the spray will serve our purpose.

"The Seco spray is built to-day for commercial use in three sizes up to a capacity of 3,000 cubic feet of air per minute. A turret on a ship of the *Colorado* class requires less than 1,000 cubic feet of air per minute for ventilation. We then have a machine about as big as a turbo-blower on a destroyer to be fitted in each turret's ventilating system. This would not seem to offer an insurmontable problem to the designer. Moreover, the method here outlined of protecting semi-closed spaces is practicable, involves no radical change in design, and does not interfere with the efficient operation of machinery, guns, or instruments.

"The protection of the fully closed type of battle station, the third type, is rather more simple. Under this type are included the all-important spaces, the fighting tops, the fire-control stations, and the conning tower. These spaces readily lend themselves to being glassed in, where now open, and thus to being made perfectly gas-tight. The scheme for all such places is to treat each one like a small

Digitized by Google Original from UNIVERSITY OF MICHIGAN

submarine; completely to cut off any ventlating ducts that may be installed so that no gases can get in by any means so long as the compart remains intact; and to keep the air inside pure. In this way the personnel could perform its duty under perfect conditions, unhampered by gas mask or protective clothing. When we cut off ventilation systems to these compartments, it becomes necessary, of course, to have some sort of air revitalizing apparatus within each such compartment, an apparatus that will not only keep the carbon dioxide content of the air low and supply oxygen, but also keep the humidity relatively low, and the body odors of the occupants of the compartments from becoming obnoxious. Such an apparatus has been perfected and installed on a number of our submarines. It consists of a motor-driven fan which sucks the air in the compartment up through a container filled with a specially prepared soda lime. In passing through this chemical all carbon dioxide is removed, water vapor above a certain reasonable amount, and also body odors caused by perspiration. A charge of 40 pounds of soda lime will last for 16 hours running continuously. Pure oxygen is liberated from tanks which in our case could be stood in a corner of the compartment or else tucked under a table or desk out of the way. In the report of experiments conducted by the American University experimental station in 1917, it is stated that the apparatus kept the carbon dioxide content down to less than one-half of 1 per cent when 23 men were confined in a submarine for 48 hours. At the end of the submergence the air was as pure as when the test started. Three charges of lime were used in the carbon dioxide removers, changes being made while the test was running. A little over 6½ tanks of oxygen were consumed. This was for a 48-hour submergence, it will be borne in mind. The needs of a ship will probably never exceed a continuous run of 12 hours.

"The method outlined here for protection of closed spaces should be extended to embrace as many compartments as possible. Spaces which may even require considerable change in the design of minor parts of them should be so protected. Its advantages lie in the complete independence of each compartment regarding its protection, the perfection of the protection, and the ease with which personnel therein can perform its duty.

"The last type of space that requires consideration is that which embraces propelling machinery, electric generators, or heat machines such as the evaporators. It is not believed possible to provide purifiers in the ventilating systems in these compartments because the quantity of air required is too great. For instance, to refer again to the *Colorado* class, each engine room requires 55,000 cubic feet per minute; and the evaporator rooms 6,000 cubic feet per minute. Even the smallest

Digitized by Google Original from UNIVERSITY OF MICHIGAN

figure here would require two Seco sprays, each of 3,000 cubic feet capacity and about 5¼ feet in diameter and 4½ feet high. The largest figure would require 40 such purifiers and a tremendously complicated system of air ducts. The question has at times been raised, Why not use a very large canister similar to that our doughboys used as an air purifier? The reason is that one large enough to take care of the volume of air required would be about two-thirds as large as the ship itself. No such scheme can be used for engine rooms, or indeed for any other ventilation system. Nor can these spaces be protected by making them closed and gas-tight for very obvious reasons. We are left then with the proposition that air, contaminated or not, must be used in vast quantities in the 'black gang's' domain. How to protect the personnel without forcing them to wear gas masks?

"A system of inner compartments should be used, which should be made gas-tight and be provided with submarine methods outlined above for air renovating. It should be provided with adequate glass windows, and to it should be led all pipes, valves, switches, and levers, through gas-tight gaskets, necessary for the operation of the ship's compartment in which it is located. In short, each fireroom, engine room, motor room, generator room would have within it a central operating station, glassed in and air-tight, within which the personnel could be housed in perfect protection and still perform their duties. Then the ordinary blower system for supplying the necessary air to engines, boilers, and generators would be operated as usual. By such a system the men could work at maximum efficiency without the necessity of wearing masks or protective clothing."

THOMAS WAKLEY AND THE LANCET.

The centenary number of the Lancet appeared on October 6, 1923, and in it the present editor, Sir Squire Sprigge, has admirably chronicled the events of its career during the past hundred years. The first number of the Lancet was issued on October 5, 1823. Its founder was Thomas Wakley, a young practitioner of London, who resented the abuses and the injustice which were then rife in the medical profession. At that time, although the medical student might pay his fees and attend lectures at the London medical schools, these lectures were not delivered by the eminent men who received the fees, but by their assistants; presence at post-mortem examinations was only secured by the clandestine feeing of porters in post-mortem rooms; the lists of operations at the great London hospitals were not published to the students at large, but only communicated to the favored pupils of the staff, who knew what was going to be done by the great surgeons and at what time. A popular operator,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

lecturer, teacher, or consultant could ask and obtain high fees from his pupils, therefore a command of money at the beginning of a student's career was necessary to insure success, while lack of money as a usual thing condemned a man to an inferior position in the medical world for the rest of his life. Wakley, himself a poor man, having lived as a student with other hard-working medical students of similar means, having shared their labors, knowing their trials, and estimating the amount of good they did and the amount of influence for good that they were able to exercise over the community, recognized that these men were set to one side and looked down upon by their privileged brethren, who had obtained their places in the profession by purchase and not by merit. Nepotism was rampant in the medical schools, and the system of teaching was faulty. The conditions were too special for treatment in the newspapers of that day without a tedious amount of preliminary explanation, but the medical men would have no difficulty in appreciating the need for reform. Therefore, influenced by a chance acquaintance with William Cobbett, who at that time was publishing in his paper, the Political Register, his shrewd and eloquent criticisms of rural conditions in England, Wakley determined to get his arguments for reform before the medical profession and the general public by means of a weekly medical periodical.

For the first 10 years of its existence the Lancet was a dueling ground for a series of fierce encounters between the editor and the members of the privileged classes in medical practice. The lectures of certain of the prominent surgeons and physicians were reported in its pages, to the exasperation of the lecturers and the delight of the students and the profession at large. The lecturers feared that their fees as teachers in the London schools would diminish if the cream of their teaching could be bought for 6 pence a week instead of £5 a session. The meetings of the medical societies were reported at such length as their importance appeared to warrant—a proceeding which the officials of the societies objected to as an infringement of copyright. These officials belonged to the class from which the honorary staffs of the hospitals were selected, and thus they were doubly outraged. Everyone who had anything to gain by the existing methods in school, hospital, or society looked with uneasiness at the new journal. A few of the privileged members of the profession became frightened at the exposures of abuses which were appearing in print, and they denounced the editor as a literary pirate and a disseminator of moral garbage. Wakley's replies were chiefly in the nature of reflection on the complete and fretful ineptitude of his denunciators. Following his assertion that the elections of the staffs of the various London hospitals were made at the instigation of pure nepotism, accounts were given of maladministration in the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

medical schools and malpractice in the hospital wards. As a result the editor became involved in frequent lawsuits, in which he was always supported by public opinion and assisted by public subscription. He next attacked the Royal College of Surgeons of England, whose by-laws made it compulsory for students to attend the lectures of certain hospital officials, some of whom charged very large fees for inferior instruction. This controversy was instrumental in causing Wakley to enter Parliament in an attempt to find a constitutional remedy for the many defects present in medical training in England. His efforts in Parliament eventually led to the act under which the General Council of Medical Education and Registration was created.

Among other subjects ventilated by Wakley in the pages of the Lancet during the early years of its existence were the administration of the poor law, the advocacy of medical coroners, the care of the insane, the adulteration of food, and body snatching.

Early in his editorial career Wakley drew to the staff of the Lancet men of ability who had studied in Paris, and when the courses of study at the London hospitals or the anomalies of English medical education were the subject of discussion the invariable habit of the paper was to draw comparisons between what happened at the Paris hospitals or at the University of Paris and what prevailed in England. In this way a very close bond was set up between the Lancet and French practitioners. As a result of this *entente* translations of the lectures of the great French teachers appeared frequently.

When Thomas Wakley died, in 1862, it was said that he had started principles of reform and in large part secured their realization. Through his efforts the status of the medical practitioner had been advanced. He fought the battle of the medical student and the general practitioner at a time when universities and medical corporations seemed to regard both as persons who should pay fees but whose interests were otherwise of no consideration. He exposed impostors and denounced quackery, while he published medical information which would otherwise have been entirely lost, doing so in the first instance at considerable pecuniary risk, if not in defiance of the law at the time.

DIATHERMY IN PNEUMONIA.

Diathermy is the application of the bipolar high-frequency current of D'Arsonval. It has been successfully employed in the treatment of pathological conditions in which the application of heat to the tissues is indicated. The physiological effects of diathermy on living tissue naturally differ greatly from those of any form of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

external heat. The heat produced by the D'Arsonval current develops deeply within the tissues. Very little effect is obtained upon the skin with the use of proper technic. In the deeper tissues through which the current passes there is an acute temporary dilatation of the capillaries resulting in an outpouring of blood serum rich in repair material. In an area affected by the current there occurs an increase in all of the blood elements, the erythrocytes with their contained oxygen and phagocytes which enhance the local resistance to bacterial invasion. A temporary active congestion is brought about and lymphatic drainage is augmented. The oscillations of the D'Arsonval current are so rapid that no ionic movement and no muscular contraction is induced. Pain is relieved by the effect of the current on sensory nerve endings within its pathway.

Shortly after the war certain physicians who had seen the benefits of diathermy as applied to various inflammatory processes suggested its employment in pneumonia. It seemed reasonable to suppose that a centrally located heat of from 110° to 120° F. developed in the affected lung without any cost to the body in instituting this rise in temperature should have a favorable effect on the pneumonic process. It was believed that this heat would dilate the pulmonary capillaries and lymphatics, and thus promote a more active circulation.

The results obtained in the early investigation of diathermy as applied to pneumonia were sufficiently favorable to justify continuance of the study of this form of treatment. Prominent among the investigators was Dr. H. E. Stewart, of New Haven, Conn., who contributed a paper on the subject to the Rhode Island Medical Journal of October, 1923.

Most of his observations were made in one of the hospitals controlled by the United States Public Health Service. The patients were all adults, nearly all of them merchant seamen, averaging about 35 year of age, and many of them were moderate users of alcohol. Judging from mortality statistics, the death rate in such a class of men should be about 40 per cent. A group of 21 cases whose treatment did not include diathermy was used as a control test. In the groups treated by diathermy the mortality was less than 20 per cent; in the control group it was 42.9 per cent. Among cases treated in private practice the average mortality was less than 12 per cent. Temperature, pulse, respiration, and rate of resolution all seemed to be favorably affected by the treatment. Extension of the disease to other lobes, however, was not prevented. No contraindications to the treatment have appeared. A period of lessened pain and dyspnœa, lasting in most cases several hours after the treatment, is in itself sufficient to justify the use of diathermy in pnuemonia.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The technic of the treatment as outlined by Doctor Stewart is as follows:

"To treat cases by diathermy the physician must have an efficient piece of apparatus delivering a good D'Arsonval current and supplied with a meter. He must understand the physics and physiological effects of the current and know his technique. While diathermy technique is not very complicated, it is rather exact. As in other types of treatment, the earliest possible administration of diathermy is desired once a diagnosis is made. As far as the writer is aware, no case has yet been lost in which diathermy was used before the third day. This does not mean that cases treated early will not be lost in the future, but it at least emphasizes the value of early treatment. We do not have to wait until the sputum has been typed, as is the case in using serum in Type I. The word "cure" is not used nor meant to be implied in this paper. It is the writer's personal opinion that an adjunct which may be applied to all types of the disease, which will prove at least as effective on the average as serum has proven in Type I, has been found.

"The D'Arsonval current is one of high voltage and relatively high amperage which oscillates with extreme rapidity. The apparatus should by preference be supplied with a 110-volt, 60-cycle alternating current. This current it "steps up" in voltage to many thousand, cutting down the amperage in direct proportion and increasing the alternations to a million or more per second. The current thus produced has been compared to water power, particularly to a stream coming from a fire hose through a spray nozzle, harmless yet with great power behind it.

"The spark gap requires constant care in order that the current may be smooth in quality, free from faradic effect, and of sufficient volume due to proper charging of the condensers. The milliampere meter consists of a wire in the circuit which expands by the heat produced, moving the needle on the scale. It indicates the total amount of current the patient is receiving, but does not indicate with any exactness the amount of heat actually being generated in the tissues. This depends upon the current density—that is, the number of milliamperes per square inch of electrode, and the density of the tissues through which the current passes. For instance, with 2,000 milliamperes of current and 5 by 4 inch plates, we have a current density of 100 per square inch of electrode. This meter reading and these plates would develop far greater heat applied to the knee joint than to the abdomen or chest.

"If the plates were larger less heat would be developed in either locality. In the consolidated lung we have an intermediate condition of soft tissue density and use from 1,000 to 2,000 milliamperes of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

current by means of about 5 by 7 inch electrodes. It must be remembered that the heat produced varies as the square of the current strength, therefore slightly increased meter reading may mean considerably greater heat production.

"*Apparatus.*—Practically all of our work was done with small compact portable apparatus supplied with a meter. It is necessary to use one which will deliver a D'Arsonval current of good quality and up to 2,000 milliamperes. A machine which will show a high meter reading with a comparatively low spark gap is to be preferred.

"*Electrodes.*—In all of our pneumonia work we have used composition 22-gauge flexible metal electrodes. This material comes in sheets at moderate cost and can be cut into convenient sizes and shapes. The edges should be sharply turned back and rolled flat with a slightly longer flap on one end for the attachment of the cord clip. Some prefer the thinner metal which may be doubled and still remain very flexible.

"*Technique.*—With a pair of plates suitable in size to the involved area of the lung and the machine set up, we are ready for the treatment. The electrodes are covered with heavy, warm shaving-soap lather. The posterior one clipped to the cord and turned lather side up on a heavy folded bath towel. By depressing the mattress this electrode may be gently moved under the patient to the desired location without disturbing him in the least. The anterior plate is then clipped on and placed on the chest wall so as to include the affected lobe or lobes directly between the two plates. They should not approach each other on the lateral wall of the chest, otherwise an undue amount of current will pass between these near edges rather than through the affected lung. The posterior plate is secured by the patient's weight. The anterior one may be gently held on the chest or secured by adhesive plaster. Cords and clips should be covered so that they will not be torn loose by a restless or irrational patient. With everything in readiness the rheostat and spark gap are slowly advanced until the desired amount of current, usually between 1,000 and 2,000 milliamperes, is reached after about 5 minutes. This is maintained from 15 minutes to an hour, usually 20 to 30 minutes, after which it is slowly reduced during a further period of 2 or 3 minutes to zero. If it is desired to localize the heat more sharply this may be done by using a slightly smaller electrode nearer the point it is desired to reach. If any points of burning or tingling are complained of, turn the current slowly off, reinsert more soap lather with finger or brush, press the electrode gently in place and again turn on the current slowly. As a rule the treatments are given twice a day, but there is no reason why

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in the critical stage of the disease more frequent applications should not be made. One treatment a day is probably sufficient during the period of resolution."

FOOD ALLERGY AS A CAUSE OF IRRITABLE BLADDER.

In an article on food allergy as a cause of irritable bladder, appearing in the Southern Medical Journal of October, 1923, Dr. W. W. Duke calls attention to a condition with which most of us are unfamiliar. In some cases of frequent painful urination, the severity of the disorder seems out of all proportion to the lesions found after careful examination, and in spite of the symptoms resembling cystitis the urine may be free of both bacteria and pus. Treatment of the condition may give little relief and severe bladder symptoms may continue without remission for months or years.

Bladder disorder of this sort is often the result, the writer believes, of hypersensitiveness to certain foods. The bladder mucosa does not ordinarily come in contact with foreign substances. Bladder symptoms of an allergic nature should occur theoretically, therefore, only as part of a general reaction after the offending substance is absorbed in some distant locality. A bladder attack of this nature would seem analogous in pathogenesis to asthma caused by the ingestion of egg rather than to asthma caused by direct contact between the bronchial mucous membrane and a pollen to which it is sensitive.

The writer comments on a study of five patients who seemed to him to be examples of bladder allergy. Each of the five was subject to attacks of frequent painful urination. In these patients nothing was found by history, physical examination, Roentgen examination, or laboratory tests which could account for the severity of their symptoms except hypersensitiveness to certain foods.

Each gave positive cutaneous or intracutaneous tests upon injection of small amounts of substances extracted from one or more foods which they were in the habit of eating, and in each a characteristic exaggeration of the bladder symptoms followed the cutaneous tests or the subcutaneous injection of small amounts of extracts to which they gave positive cutaneous tests. Four of the five patients were completely relieved of bladder trouble by avoidance of the foods to which they were sensitive, and four had a return of the symptoms during a remission after eating, as a test, of foods to which they were sensitive.

PROPHYLACTIC INJECTION OF NORMAL SERUM AGAINST MEASLES.

On two occasions during the past year the Lancet has called attention to the work of Dr. R. Degkwitz, of Munich, who produced an

Digitized by Google Original from UNIVERSITY OF MICHIGAN

immunity against measles by injections of serum obtained from patients convalescent from the disease. We learn from the Lancet of September 22, 1923, that Dr. Gustav Salomon, in combating a severe epidemic of measles in the Waisenhaus and Kinderasyl in Berlin, found that the supply of convalescent serum was insufficient to fill his demand, and as the epidemic was a particularly severe one, and every child exposed to infection contracted it, he experimented with injections (10–15 c. c.) of serum obtained from adults who had had measles in their infancy. He had the opportunity of dividing his cases (all of whom had been exposed to infection) into three groups—namely, 60 children untreated, 62 treated with M. R. S. (Masern-rekonvaleszenten-serum), and 72 treated with adult serum. Of the 60 untreated cases all (100 per cent) became infected and 58 per cent died; of the M. R. S. children more than half (59.7 per cent) were protected, while 16 per cent died; and of the adult serum cases 52.6 per cent remained immune and 13.8 per cent died. Out of the 44 deaths, 34 were consequent on broncho-pneumonia, and 10 died while the rash was out. Of the cases which recovered 13 developed broncho-pneumonia. This complication therefore attacked in all 47 cases, 28 of the untreated, 13 of the M. R. S., and 6 of the adult serum cases. The course of the disease, when it occurred in those who have received prophylatic injections, appeared in most cases to be much milder, abated more rapidly, and showed a longer incubation period than the untreated cases. The M. R. S. used in this series was obtained from infants under one year, and was probably not so rich in antibodies as that used by Degkwitz, which was obtained from older children. This fact may account for the lower percentage of good reults as compared with his. The prophylactic injection of adult serum appeared to give approximately a similar protection against measles with regard to the incidence, mortality, course of the disease, and complications as the M. R. S. used in this series.

LAMBLIAL DYSENTERY TREATED WITH CARBON TETRACHLORIDE.

In an original communication to the Journal of Tropical Medicine and Hygiene of September 15, 1923, Khalil and Shawky report from Egypt their experience with carbon tetrachloride in the treatment of lamblial dysentery. *Giardia* (*lamblia*) *intestinalis* was the only pathogenic organism found in the cases reported. In the absence of any known specific treatment for lamblia infection, carbon tetrachloride was administered as an experiment. The immediate results were gratifying. The symptoms of dysentery in each case promptly disappeared, and examination of the stools failed to show the presence of either lamblia or their cysts.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Although the cases reported are too few in number to warrant any definite conclusion, especially since lamblia infection is characterized by intervals of freedom from diarrhea and occasional absence of the organism from the feces, yet the immediate relief from the symptoms after the administration of carbon tetrachloride justifies an extended trial of this remedy in this type of infection.

THE ENDOCRINE SURVEY.

The first issue of the Endocrine Survey, published at Glendale, Calif., appeared during October, 1923. This publication is a result of the consolidation of The Organo-therapeutic Review and The International Digest of Organo-therapy, and will endeavor to present to its readers each month a part of the large amount of information appearing in current medical literature pertaining to the practical aspects of endocrinology and organo-therapy. The initial number contains readable abstracts of articles which have appeared recently in American and foreign journals, reviews of recent books dealing with the endocrine glands, letters from abroad, and answers to inquiries concerning problems arising in the practices of subscribers.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS.

It is the bureau's desire that all members of the Navy Nurse Corps avail themselves of every opportunity to keep themselves informed of the advances taking place in the nursing profession; that they take an active part in local nursing organizations in proximity to their various stations of duty and thus become a vital factor in the nursing world. The Surgeon General offers every opportunity possible to nurses who desire to undertake special study in order to make themselves of more value to the naval service. Since October, 1922, 23 nurses have taken special courses in dietetics, advanced laboratory work, physiotherapy, and a course for instructors of nursing. Eleven nurses are at present taking courses in three of the above subjects. Courses in anæsthesia at the Lakeside Hospital, Cleveland, and Graduate School of Medicine and Surgery of Pennsylvania will start in December and January. As time goes on and the naval hospitals become equipped with these nurses, it is expected they will prepare others in their special lines and instruct the hospital corpsmen. The program is a big one and it will take time to carry it out in full, but if each nurse will take a personal interest in fulfilling her obligations, first, to her own self-respect and, second, to the advancement and high standing of the corps, she will find the reward rich in the respect shown to the individual as well as the whole.

Some nurses have raised the question as to whether one who has undertaken a special course and has perfected herself in a specialty would be under obligation to continue in this special line of work throughout her naval service. Some appear loath to undertake a line of work which might serve to isolate them from the general practice of nursing. It is the Surgeon General's wish that nurses who have received the advantages of special courses should render service in this special capacity for reasonable length of time, but he does not want nurses to feel that because of this study they are exempt from any duty which may be required of them in the naval hospitals; also if a nurse has given a special subject a reasonable amount of time and wishes to have a change, her request will of course be given every consideration. The bureau feels that the best work is given where cooperation, interest, and enthusiasm abound. The Navy nurses never fail to handle every problem given to them with efficiency and dignity and it is felt they will respond with equal energy to the call to advance and grow strong in the profession.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Many members of the Navy Nurse Corps have expressed a desire that the Navy Nurse Corps section, which formerly appeared each month in the United States Naval Medical Bulletin, be continued; therefore it should be a source of gratification to them to learn that with this issue the section starts once more on a career whose length and importance will be determined by the Navy Nurse Corps. The bureau feels that each Navy nurse should be sufficiently interested in this section to take an active part in its production and to make it so interesting that its appearance each month will be looked for with pleasant anticipations. Therefore, let each of us take a personal interest in this section, not by reading it as it is published, but by sending items of general nursing interest to the superintendent of the Nurse Corps for incorporation in the section. If you can not write or have nothing of interest to tell of your own work, look about and ask some prominent person in the nursing profession to give you an interesting bit that you know the corps will be delighted to read. We must be up and doing and let people know we are not drones, but thoroughly alive and alert.

The American Nurses' Association, of which each Navy nurse either on the active list or honorably discharged is a member, meets next June in Detroit, Mich. There will be meetings of the special section of the association devoted to the nursing services of the Federal Government, and it is hoped that every Navy nurse who can attend these meetings will do so and will go to Detroit full of enthusiasm for the advancement of the Navy Nurse Corps and her profession. It would be kind if all those who read this would write to friends out of the service and ask them to attend, that it may not only be a meeting of strength, but somewhat of a reunion of the corps we love so well.

The two following excerpts from letters recently received by the superintendent of the Navy Nurse Corps reflect some of the activities of that corps in our island possessions.

The letter from Grace Pepe, the Nurse Corps' little Samoan protégé, is peculiarly interesting. The sincere gratitude of the native nurses of Samoa for what the Medical Department of the Navy has done for them is clearly expressed. Pepe's letter appears just as she wrote it.

"I'm glad to have this good chance to say thanks to all the Doctors and the Navy Nurses too who were here for duty from the beginning of the Training School for nurses until today.

"I should tell the world how nice they are to the Samoan Nurses and what they have done for us, not for the nurses only but for all

Digitized by Google Original from UNIVERSITY OF MICHIGAN

our Native people who are under the care of the United States. Thanks very much for supporting us for all things we need down here. The Doctors and the Navy Nurses have done so much for the Samoan Nurses in many, many ways, I could not say all what they were, but you can see now how much we can write or say in English; that is a great work the Navy Nurses taught us. It is a hard work to teach us and trying to show us how things should be done. They have done very well for us and I appreciate it very much.

"We are very glad we came to this training to be educated; we have learned very many new things in this training, but we depend on the Doctors and the Navy Nurses for everything about this work. We are surely happy to leave with them for we can not do much without their help; we need them very much to be near us and to watch us and see how we would be coming along, and we are surely glad to work with them or help them for few things we could as they help us a lot.

"I should say for this work it is very useful to us and for our people too, it is so interesting too; when I look back at the beginning of my time in the training school till today. Sometimes while I am in training I felt discouraged hearing people say things to make us discouraged but in other movement, when to get cooled off, won't listen to what they were saying, just kept on working or doing some to cheer up, and tried to forget the unhappy things. But sometimes I feel that I could do more little things to help among the sick people.

"When our first class graduated we were glad that we had been taught in this training, and then when we came back from our leaves we received orders from the Doctors for the two of us to go out among the people in the district. I was a little discouraged to go out at first for not knowing how the people would treat us, and that would be our first out to the districts, had no idea how things should be done. But after all we went out with some instructions from the Doctors to be carried out in each place we stop.

"At the first place I arrived in the Western District, spent few days to stay there and treated some eye cases and was trying to talked over with the women to show them a little how to take care their children; some of the women were very interesting and listen what they should do for their children. I take this first place for a good example how things to be done in the district and that encourage me to do my work and I felt happy because I found something to do and still looking for more work in the future and the discouraged feeling is all finished. For the next place I had my thoughts prepared and also things which would be used. The work is getting

Digitized by Google Original from UNIVERSITY OF MICHIGAN

interested for these few months outside, of course would feel lonesome sometimes but would forget all about it if there is work to do.

"In July, 1918, I found a very interesting case; it was a little infant was born in the same place where I stopped for that time. After this poor infant was born, the mother and the family were scared to touched, for she was too small, it should weigh only three pounds. So they sent for me; by the time I arrived, the cord has not being cut, not a thing was doing for the poor thing, didn't even cry or opened its eyes. So I started to do all what I could do for this interesting, and after things done for it, then started to move a little and open its eyes.

"I kept her wrapped in cotton for the first few months to wait and see how she would be coming along, and oiled with cottonseed oil twice a day in the morning and night before its bed time. I used medicine dropper to feed with from milk in a medicine glass which had been squeezed from the mother's breasts. Had been using the cotton-seed oil right along to bathe with for the first month and used boiled warm water to drink between feedings. I spent nearly two months to stay closed to watch her; while staying there, I was tickled to death to see it's improving each day. I was quite interested in my little pet.

"The family of this baby were quite surprised to see this baby come out right along nice each day; before I left, the mother has been taught how to take care this little pet. That gave this family a good idea how things done so lovely at the hospital, these people never thought the little thing would live for one day. Thanks to the Lord to save this baby, that would give the people a good example so they could follow it. I take that deep in my mind, it wasn't my good in the care of this infant, but for the Doctors and the Navy Nurses who taught me right here in this training. I should say that, for the people who have done a good work for the others will follow their good work for themselves. You could see now days the splendid work you Navy People done for us and all the kindness as we see down here; so we have to follow and try to do the same as we are being taught here.

"In spending a few months at the Naval Hospital in Mare Island, I should thanks for the admitted of me there; there was none to make me discouraged, all I met just the smiling faces, and they were certainly treated me well. I have learned a lot, and there were many million of different things I had seen there than what we have here, had seen many things than what I have heard about it. And I was interesting with all the new work and wished some of my training would be there with me to see how things were far different from our hospital.

Digitized by Google Original from UNIVERSITY OF MICHIGAN



THE WEEKLY BABY CLINIC IN ST. CROIX.



INSPECTING THE SCHOOL CHILDREN IN ST. CROIX.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



THE NATIVE GRADUATE NURSE DRESSING MINOR SURGICAL CASES.



A ROAD SIDE CLINIC IN ST. CROIX.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

"I would love to watch every direction to movement while the people were working and done things so quickly, and they have done them so lovely too. By that way, was trying to open my eyes and ears and learned all as fast as I could before returned back to my own place. I had forgotten all about being tired from being working but felt happy to work for the suffering people.

"Had more new experiences for few weeks at the Children's Hospital, more interesting things they done and they did few things differently that give me more new idea to learn and to know about the different ways. Had many things to learn while in the hospital there or going out from the hospital.

"By the time I returned I have told many things to the Nurses and all my people whom I could meet, and was trying to show the nurses as I had seen there in the States. We are certainly glad that we are under the rules of America.

"Will be very glad to write more to follow this sometime if they willing to. I am sending regards to all Doctors and Nurses who are good friends to Samoan Nurses.

"Very Sincerely,

"GRACE PEPE."

Miss J's duty at Christiansted, St. Croix, Virgin Islands, seems to be that of a district nurse and she is greatly enthused over her work among the natives in their "villages," as the plantation laborer's quarters are called. She says:

"With an attachment on the side of a Ford car, holding solution bottles, and an especially contrived medicine chest with partitions and holders for medicines, ointments, gauze, bandages, and other necessities for usual dispensary clinics, we leave town every morning at 8 o'clock, going thrice weekly on each of the two routes through the Christiansted district, which embraces half of the territory of the island, and returning around noon.

"The colored graduate nurse, always accompanying the Navy nurse and giving all treatments, was a graduate under the earlier Navy nurses, and a credit indeed to her training. The greater proportion of the work is the treatment of trachoma cases, which we are happy to find are beginning to respond to the blue-stone treatment, and lessen in number. Then there is the dressing of minor accidents, of ulcers and old wounds; the visiting of sick in their one-roomed shacks in the villages, including the school children referred by their teachers when ill; consultations all along the roadside, when laborers rush out from the cane fields and stop us as we come along; the dispensing of those medicines which it is usually a nurse's privilege to administer, and the weekly examination and weighing of all babies under 2 years of age.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Those Navy doctors specializing in obstetrics and eye work each make monthly rounds, between which the cases that we are unable to handle ourselves are referred in to them at the town dispensaries.

"We grow to recognize and know the name of most of the people in the district; and as their confidence in us deepens, we are able to do more and more. They are not an especially grateful people, yet they never show ingratitude, and accept directions and instruction willingly. The entire work must undoubtedly be one of the most interesting in the service, and I am very glad to have had an opportunity to have 'carried on.' It has created for me an interest in district work which I hope I shall some time have an opportunity to study and practice. There must be many nurses in the service who also would be glad of this opportunity if they but knew of it."

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

INSTRUCTIONS ISSUED BY THE BUREAU OF MEDICINE AND SURGERY.

Circular letter. ERS:LBH P-15-42022.
Serial No. 282-1923.

WASHINGTON, D. C., *29 August, 1923.*

To: All medical officers.
Subject: Shortage in petty officer ratings in Hospital Corps.

1. The following letter has been received from the Bureau of Navigation:

"No. 2157-2973. NAVY DEPARTMENT,
"N-6-Lo. BUREAU OF NAVIGATION,
"*Washington, D. C., August 24, 1923.*

"From: Bureau of Navigation.
"To: Bureau of Medicine and Surgery.
"Subject: Vacancies in petty officer grades of Hospital Corps.

"1. The Bureau of Navigation desires to invite attention to the following conditions as existing in the petty officer grades of the Hospital Corps:

"(*a*) On February 28, 1923, there were 1,066 vacancies in the various pharmacist's mates ratings.

"(*b*) On July 31, 1923, the total number of vacancies had increased to 1,186, distributed as follows:

"C. Ph. M.	28
"Ph. M. 1c	193
"Ph. M. 2c	431
"Ph. M. 3c	534

"(*c*) During the six months' period in question the net loss in petty officer ratings of the Hospital Corps was 120, or an average net loss of 20 per month.

"(*d*) A survey of the petty officer situation for the fiscal year 1924 has recently been made, which takes into consideration existing shortages in petty officer grades, expirations of enlistments scheduled during the year, estimated losses from other causes, and reenlistments based on the percentage experience of the past six months. The final result of this analysis shows that 1,463 nonrated men of the Hospital Corps must be recommended for advancement to the rating of pharmacist's mate 3c during the fiscal year, if the desired distribu-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tion of the Hospital Corps is to be reached by 30 June, 1924, necessitating an average of 122 recommendations in the Hospital Corps per month.

"(*e*) During the month of July a total of only 37 such recommendations were received from the entire service.

"(*f*) The eligibility list maintained in the Bureau of Navigation, so far as the ratings of pharmacist's mates 1c, 2c, and 3c are concerned, can not relieve the petty officer situation in the Hospital Corps, as authorizations for advancement in rating have been issued as fast as recommendations were received, and no men are on the eligibility list for these ratings at the present time. The shortage of petty officers in the Hospital Corps is continually growing worse, and is entirely out of proportion to other branches.

"(*g*) The principal source of supply at the present time for the training and recommendation of nonrated men to petty officer grades in the Hospital Corps is the naval hospitals. The number of recommendations received during the past four months from this source is tabulated below:

Naval hospital.	Petty officers recommended for promotion.	Nonrated men recommended for promotion to pharmacist's mate.	Total.
Portsmouth, N. H.	0	0	0
Chelsea, Mass.	2	7	9
Newport, R. I.	0	0	0
Brooklyn, N. Y.	1	0	1
Philadelphia, Pa.	0	0	0
Annapolis, Md.	1	0	1
Washington, D. C.	6	7	13
Norfolk, Va.	1	2	3
Parris Island, S. C.	1	3	4
Key West, Fla.	0	0	0
Pensacola, Fla.	0	0	0
Great Lakes, Ill.	0	0	0
San Diego, Calif.	7	12	19
Mare Island, Calif.	1	4	5
Puget Sound, Wash.	0	0	0
Pearl Harbor, Hawaii.	2	2	4
Guam, M. I.	1	0	1
Canacao, P. I.	2	1	3
Yokohama, Japan.	0	0	0
Charleston, S. C.	3	1	4
Total recommendations received during period from Apr. 1 to July 31, 1923.	28	38	66

"2. The above showing is in no way comparable with the results of other commands in the training and recommendation of nonrated men of general service ratings for advancement to petty officer

Digitized by Google Original from UNIVERSITY OF MICHIGAN

grades; and it is requested that the Bureau of Medicine and Surgery issue such instructions to its medical officers as may be deemed advisable, to the end that a larger number of recommendations for advancement from nonrated to petty officer grades may be submitted.

"/s/ A. T. Long."

2. Commanding officers of naval hospitals and all medical officers will at once take steps to remedy the situation shown in the above letter by examining all hospital corpsmen who now meet the requirements of Bureau of Navigation Manual, Bureau of Navigation Manual Circular No. 21, of 1 August, 1923, and the latest Bureau of Navigation circular letters, for advancement in rating, and continuing to examine hospital corpsmen for advancement in rating as soon as they become eligible.

3. The standard of examinations will not be lowered, but every effort shall be made to instruct and prepare men eligible for examination so that they may qualify for advancement in rating.

E. R. Stitt.

Circular letter. BEI 132679(83).
Serial No. 283–1923.

Washington, D. C., *September 6, 1923.*

To: All medical officers.

Subject: Hæmostatic forceps and surgical needles carried in stock at the medical supply depots.

1. The following hæmostatic forceps are carried in stock at the medical supply depots:

(*a*) Jones, 5-inch, straight.
(*b*) Jones, 5-inch, curved.
(*c*) Halstead, 5½-inch, straight.
(*d*) Halstead, 5½-inch, curved.
(*e*) Halstead mosquito forceps.
(*f*) Ochsner-Mayo forceps, 5½-inch, 1 and 2 teeth.
(*g*) Keen (Rochester-Pean), curved, 6-inch.

2. A study of these types of forceps, bearing in mind the various needs for hæmostatic forceps for surgery in the Navy, will prove that they are sufficient for practically all purposes.

3. Many requisitions are submitted by medical officers at the different activities for unusual types of hæmostats, and frequently the types requested are almost like those on the supply table. It is therefore directed that requisitions for hæmostatic forceps be limited in every case possible to those carried in stock at the medical supply depots, and when hæmostats of a very special and unusual type are

Digitized by Google Original from UNIVERSITY OF MICHIGAN

required, the requisition will be submitted to the Bureau of Medicine and Surgery with a letter explaining the necessity for the type of hæmostat required.

4. The five bottles of assorted needles now on the supply table contain an assortment sufficient to cover practically all ordinary surgical needs. In each assortment there are certain sized needles which are more frequently used than others, and this results in the sizes less frequently required being left as "dead stock."

5. To eliminate the necessity for issuing a full assortment of needles when a certain kind or size is required, the following needles will be carried in stock at the medical supply depots as available for issue in papers of 1 dozen each:

(*a*) Hagedorn, round eye, straight, size No. 3; for suturing skin.

(*b*) Hagedorn, round eye, half circle, No. 5; for skin sutures and for muscle quilting in amputations or closure of abdominal wounds.

(*c*) Surgeon's needles, full curved, No. 6, for same purposes as (*b*), for surgeons preferring this type of needle.

(*d*) Milliner's needles, straight, No. 5, for intestinal work. These needles are somewhat similar to Mayo's straight intestinal needle, but are not quite as long and have a smaller eye. They are used extensively by surgeons doing abdominal work.

(*e*) Intestinal needles, taper point, half circle, plain eye, No. 2, for deep abdominal work where a straight needle can not be used to advantage.

6. When submitting requisitions for hæmostatic forceps or surgical needles medical officers should bear in mind the types furnished by the medical supply depots, as it is believed that the types provided are sufficient to do excellent work in connection with practically all the operative work usually done in the service.

E. R. Stitt.

Circular letter. WHM–HCM SDS 124842(92).
Serial No. 284–1923.

Washington, D. C., *September 17, 1923.*

From: The Chief of the Bureau of Medicine and Surgery.
To: All medical officers.
Subject: Form N. M. S. F (revised).
Reference: (*a*) Bureau Circular Letter No. SDS: WHM–HCM 124842(73) of 18 July, 1922, serial No. 199–1922.

1. It is directed that paragraphs 2 and 3 of reference be disregarded and that the revised Form F be used exclusively after January 1, 1923.

2. Form K will become obsolete, and it is directed that all blank copies of that report be destroyed.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

3. The old Form F may still be used by hospitals to report supernumeraries and Veterans' Bureau patients.

E. R. STITT.

Circular letter. WSD: MG 127507(44).
Serial No. 285–1923.

WASHINGTON, D. C., *September 26, 1923.*

To: All naval hospitals; senior medical officer, all yards and stations; naval medical supply depots; Naval Medical School.

Subject: Policy of United States Employees' Compensation Commission regarding employees suffering from occupational diseases; now considered compensable and entitled to treatment.

Reference: M. and S. circular letter serial No. 254–1923, No. 127507(44), April 23, 1923.

1. The following communication, received from the United States Employees' Compensation Commission under date of September 10, 1923, in effect cancels the instructions contained in reference, limiting treatment and compensation of civilian employees under the Federal compensation act to cases of accidental injury only; cases of occupational disease or conditions due to occupation may now be handled in the same manner as prior to April 16, 1923:

"Reference is made to the commission's letter to you dated April 16, 1923, in regard to the treatment of employees of the United States Government suffering from occupational diseases or conditions due to occupation which can not be considered as accidental injuries. In that letter official superiors were requested not to refer such cases for treatment on Form C. A. 16, or for examination on Form C. A. 17, to Government or designated physicians. In the light of a recent opinion from the Attorney General of the United States, the commission now feels that such cases may be considered compensable and entitled to treatment.

"It is desired to impress upon official superiors, however, the importance of the utmost discrimination in the handling of such cases. An employee claiming compensation or medical treatment for any condition not an accidental injury should supply definite information of the most detailed character in regard to the alleged cause or causes of his condition. If the slightest doubt remains in the official superior's mind in regard to the validity of such a claim, the employee should be referred to the nearest Government or designated physician for examination only on Form C. A. 17; procedure may then be continued in accordance with the commission's regulations, paragraph 31, and full information concerning the claim should be immediately forwarded to the commission."

E. R. STITT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Circular letter. WRJ-ML 125884(101).
Serial No. 286–1923.

WASHINGTON, D. C., *1 October, 1923.*

To: Naval hospitals.
Subject: Hospital accounting.

1. The bureau has received many questions from individual hospitals regarding the new hospital accounting system, and in order that these questions and answers may be available for all hospitals they have been compiled and quoted herein.

2. It has been noted from an examination of the reports submitted that the hospitals do not uniformly understand the proper method to compute "sick days" and "subsistence days" for use in connection with the preparation of the "Recapitulation." The total "sick days" should be the total sick days of all classes of patients for the month. No deductions should be made for absent days. The total "subsistence days" should be the total number of *actual* rations issued to patients (all classes), officers' mess, hospital corpsmen, nurses, marine guard, and civil employees. In the case of subsistence days, deductions should be made for all absent days, etc. The admission day of V. B. patients, which is shown on ration memo., should *not* be included in the number of subsistence days.

3. Several hospitals have submitted "Recapitulations" with a different amount shown under "Account 10. Operating expense" and the "Net operating expense" under "Analysis by departments." As the "Analysis by departments" is only a detailed analysis of "Account 10. Operating expenses," the amounts should agree.

4. Under "Statistics" on the reverse of the Recapitulation the "Daily average turnover" will be changed to "Average discharge ratio." The average discharge ratio will be obtained by dividing the "actual discharges" by the actual number of days in the month and dividing the quotient thus obtained by the average daily number of patients in hospital.

Example:

Total number actually discharged	352
Number of days in July	31
Number of patient days	14,122
352 divided by 31 equals	11.35
14,122 divided by 31 equals	455.54
11.35 divided by 455.54 equals	0.0249

2.49 per cent is the average discharge rate.

1. Q. Should capital account be changed if an error is discovered in the original entry?

A. No. Capital account should remain the same amount during the year. Any errors should be made a debit or credit to "Inventory

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

adjustments" and a debit or credit to "Equipment," "Stores," or "Real estate, land and buildings," as the case may be.

2. Q. Should the number of sick days shown on the reverse of the "Recapitulation sheet" include all sick days in the hospital or only Navy sick days?

A. The total sick days should be shown regardless of the class of patient.

3. Q. Accounting instructions state that only the salaries of chauffeurs and mechanics and employees engaged on motor vehicles shall be charged to transportation service, while it is noted that the cost of operation of horse-drawn vehicles is also charged under this department. Information is requested as to whether the salaries of teamster and stable keeper should be charged to "Transportation" or to "Maintenance, B. and G."?

A. The salaries of teamsters and stable keepers will be charged to "Maintenance, buildings, and grounds."

4. Q. Artificial limbs, abdominal binders, etc.; shall these items be charged to "Navy as a whole" and carried over in expense analysis under surgical appliances, operating room?

A. To carry the charge for items chargeable to "Navy as a whole" from the "Charge register" to the "Expense analysis register" (except where a space is provided for large items such as care of dead) will result in the inclusion of charges that should be shown on the Recapitulation under "Navy as a whole" in the "operating expenses" of the hospital.

It is not necessary to carry any items entered on the "Charge register" as "Navy as a whole" to the "Expense analysis register" except under "Care of dead." The total of the column "Navy as a whole" in the "Charge register" and the total of "Stores" issued on the "Expense analysis register" under department "Care of dead" should be the amount shown on the Recapitulation as "Navy as a whole."

To bring the expenditure of stores issued into the account "Navy as a whole," the monthly entry passed through the journal should be as follows:

(Substitute for last journal entry on sample journal.)

Operating expense	$23,000.00
Navy as a whole	160.00
To stores	$23,160.00

For summary of stores issued during month as per details in expense analysis register.

5. Q. With the closing of laundry the salary of the sewer is being charged to "Housekeeping"; is this correct?

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A. As the sewer is performing the same work now as she did before the laundry was closed, it is evident that no change should be made in the manner of reporting this expense.

6. Q. What procedure is followed when material, of any nature, is to be shipped from an activity to some other place or activity?

A. The annual appropriation bill for the Navy Department carries, under the Bureau of Supplies and Accounts, an appropriation captioned "Freight," which reads as follows: "For all freight and express charges pertaining to the Navy Department and its bureaus, except the transportation of coal for the Bureau of Supplies and Accounts."

As the appropriation for *all* freight and express charges (except for shipment of remains) is under the cognizance of Bureau of Supplies and Accounts, that bureau must authorize any expenditure under such appropriation.

The manner in which transactions of this nature are handled is as follows: The activity desiring to ship material should write a letter to the Bureau of Medicine and Surgery, giving contents of shipment, weight (if by water, cubic space), and destination. The Bureau of Medicine and Surgery will then prepare a shipment order NSA Form 564 and forward same to Bureau of Supplies and Accounts, who will, in turn, direct shipment.

As no Medicine and Surgery appropriations are involved (except for shipment of remains), an allotment card or report of expenditure will not be necessary. No bills of lading, except for care of Navy dead, should be entered in any financial books of the hospital.

7. Q. If allotments for the preparation and burial of Navy and Marine Corps dead pertain only to those on active duty, in what manner are the expenses for similar services for retired officers and enlisted men of the Navy and Marine Corps paid?

A. The appropriation bill for the current fiscal year does not provide for the burial of retired officers and enlisted men of the Navy. A bill will be submitted for the fiscal year 1925 including this feature. Under the appropriation "Contingent, Marine Corps," is included the following: "Funeral expenses of officers and enlisted men, and retired officers on active duty during the war, and retired enlisted men of the Marine Corps, including the transportation of bodies and their arms and wearing apparel from the place of demise to the homes of the deceased in the United States." Funeral expenses for retired marine officers who were on active duty during the war and for retired enlisted men is a proper charge against the appropriation "Contingent, Marine Corps." It is not necessary to submit a requisition to cover this service, but the bills should be forwarded, properly certified, to Marine Corps Headquarters for payment.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

8. Q. What accounting procedure is made for flags used in draping caskets?

A. Flags used in draping caskets are not a charge against any Medical Department appropriation. They, therefore, can not enter into the cost accounting system of the activity. For the purpose of recording transactions of this nature a memorandum book should be kept at each activity.

9. Q. What accounting procedure is necessary when material is received from any source without appropriational charge?

A. Stores received with price (or when not priced, should be appraised) but without appropriational charge should be taken up through the journal as a debit to "Stores," "Equipment," or "Real estate, land and building" and a credit to "Transfer vouchers received."

10. Q. What accounting procedures take place when material is surveyed?

A. Material may be surveyed for several reasons, such as wear, out of date, missing, destroyed by fire or other disaster, broken, etc. The recommendations of the board may be as follows: Destroy, retain for repair, sale, return to M. S. D., or such other recommendation as may be pertinent at that time. Material which is worn-out by service, rendered obsolete by age, broken during usage, or rendered unfit for further use by reason other than theft, fire, disaster, or similar causes, is considered as having properly fulfilled its original purpose and is rightfully a charge against the operating expenses of the activity. Its disposition after survey does not alter this charge in any way. Equipment is credited with the book value of the items surveyed and this same value is a debit against "Operating expense." Material surveyed as the result of loss, destruction by fire or other disaster, is not a charge against operating expense inasmuch as the activity has not been benefited by its use. It is, therefore, a charge against "Contingencies and losses" and a credit to "Equipment."

11. Q. Shall funeral expenses for Veterans' Bureau patients be placed under "Care of dead"?

A. That part of any funeral expenses for Veterans' Bureau patients that is paid from naval appropriations will be a charge against "Care of dead." If the cost of embalming, encasement, or other expenses, including the issue of a Navy standard casket, is paid from naval appropriations the charge should be "Care of dead."

Transportation of remains is not a charge to "Care of dead" (Veterans' Bureau only), as the bill of lading is made a direct charge to the Veterans' Bureau appropriations; therefore would not be charged to any naval account.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Transportation of the remains of Veterans' Bureau patients should not be reported on the "Recapitulation" nor should they be reported on the "Report of expenditure card."

It may also be stated that transportation of Marine Corps dead on bill of lading is not a charge to M. and S. appropriations, therefore should not be included in accounts or on "Report of expenditure cards."

12. Q. What disposition shall be made of charges received and paid after July 1, 1923, for items of stores and equipment taken up in inventory July 1, 1923, received in fiscal year 1923?

A. As the stores have already been included in the inventory of July 1, 1923, it would result in a duplication of charges if any entry was made in the charge register or through the journal. The amount should be entered in the old bill book under the fiscal year 1923 and no entry made in any of the books of the new accounting system, except, of course, in the store or equipment ledger.

13. Q. What disposition shall be made of charges received and paid after July 1, 1923, for items of stores and equipment that were not taken up in inventory of July 1, 1923, order having been placed during fiscal year 1923?

A. Entry should be made in "Charge register" in the same manner as if stores or equipment were purchased on 1924 appropriations. The cost-accounting system does not take cognizance of yearly appropriations.

14. Q. What disposition shall be made of salaries paid teachers of Veterans' Bureau patients?

A. The amount will be included in the operating expenses of the hospital and will be shown on the reverse of the "Recapitulation" under "Analysis by departments" as a separate entry. The entry will be made on the vacant line next after "Staff quarters."

Occupational therapy ---------- *** *** ***

If any supplies are issued from stock, this should be shown under supplies. An additional sheet may be maintained in the Expense Analysis Register for this purpose.

E. R. Stitt.

Circular letter.
Serial No. 287–1923.

WWB–LBH F–1–42022.
Washington, D. C., *9 October, 1923.*

To: All medical officers.
Subject: Examination Report, Hospital Corps, U. S. Navy; Form N. M. S. H. C. 1.

1. On all revised copies of the above form you will cause the following changes to be made in ink immediately upon receipt of this letter.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(*a*) Line 2 from bottom of page, left side, reading "Examine Ph. M. 3c. in subjects 1 to 6, inclusive," change "6" to "7."

(*b*) Last line, right side of page, reading "Dept., Art. D–4341, Bu. Nav. Manual," add following new sentence: "Candidates for pharmacist's mate, first class, not to be examined in subject 13, administration."

F. L. PLEADWELL,
Acting.

Circular letter. AWD MET 125470(102).
Serial No. 288–1923.

WASHINGTON, D. C., *10 October, 1923.*

To: All naval hospitals.
Subject: Analysis of the naval hospital ration for 1923 (continental hospitals only).
Inclosures: (*a*) Photostats.

1. The bureau forwards herewith photostats of graphs of the cost of the ration at the various naval hospitals, and also of other tables in connection therewith, which are believed to be of interest to those connected with hospital administration.

2. The average cost of the hospital ration was $0.75, as compared with $0.78 for 1922. The average cost for the seven most active hospitals (Group I) was $0.71, exactly the same as in 1922; in Group II (four hospitals), those of medium activity, $0.78, as compared with $0.88 in 1922; in Group III (five hospitals), inactive, $0.75, as compared with $0.77 the previous year. This represents a saving of $64,229. From the above, it is deduced that the reduction in the cost of the hospital ration occurred at the smaller hospitals. In a measure the reduction is traceable to lowered contract prices, but it is believed this is not entirely accountable for it. The average cost of the ration for 1922 in the east coast hospitals, less those in Group III, was $0.75, in the three west coast hospitals $0.653, showing marked economical management in the later. There is no evidence that this lower cost is due to lower contract prices as is generally maintained, but in some measure may be attributable to the quite general employment of Chinese in the commissaries. The dominant factor, however, is contained in the following:

3. *The caloric value of the hospital ration.*—In the bureau's circular letter of 12 March, 1923, paragraph 2, the statement is made that 3,500 to 4,000 calories is believed to be adequate. This opinion is sustained by the fact that in some hospitals the ration is approaching this figure and, according to observation, reports, and general reputation, is satisfactory and adequate. The average caloric value of all the continental hospital rations is 5,900: of the west coast hos-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

pitals 4,800, and of the east coast (less Group III) 6,000. The highest food value of Group I was New York, 7,000; of Group II, Newport, 6,700. The lowest calories purchased was in Group I, San Diego, 4,900 calories; Group II, Puget Sound, 4,100. It is evident that if the personnel can be well nourished on a ration equivalent to 4,900 calories at San Diego, 5,500 at Mare Island, that Norfolk does not require 6,200, nor New York 7,000. It is equally evident that if Chelsea, situated in a high latitude, subsists on 5,600 calories, Norfolk does not require 6,200, nor New York 7,000. If Puget Sound, Wash., and Great Lakes find 4,100 to 5,800 calories ample, there is no apparent reason why Newport requires 6,700 and Annapolis 6,200.

4. In order that criticism may be constructive, it is desirable to further analyze the ration by comparing the purchases of foods of a high caloric value at the highest and lowest of each group. By reference to Chart 5, it is seen that the New York hospital paid for the equivalent of 2,400 quarts of milk per man for the year, while San Diego purchased but one-third that amount. The excessive issue at New York was due largely to the ordering of double cream (40 per cent). In Group II, the equivalent of 1,590 pounds of milk per man per annum was delivered at the Newport hospital, while Washington, equally active, purchased 820, and Puget Sound, the lowest in total ration calories, but 325 pounds. Group III shows an excessively high ration value, 8,900 calories for Charleston, and a moderately low one for Key West, but the overturn of patients is so small as to make deductions of little value. It is evident that both the cost and caloric values at Charleston are traceable to a heavy issue of all classes of foods except eggs and butter. At Key West, the foods used show recourse to eggs rather than milk and meats.

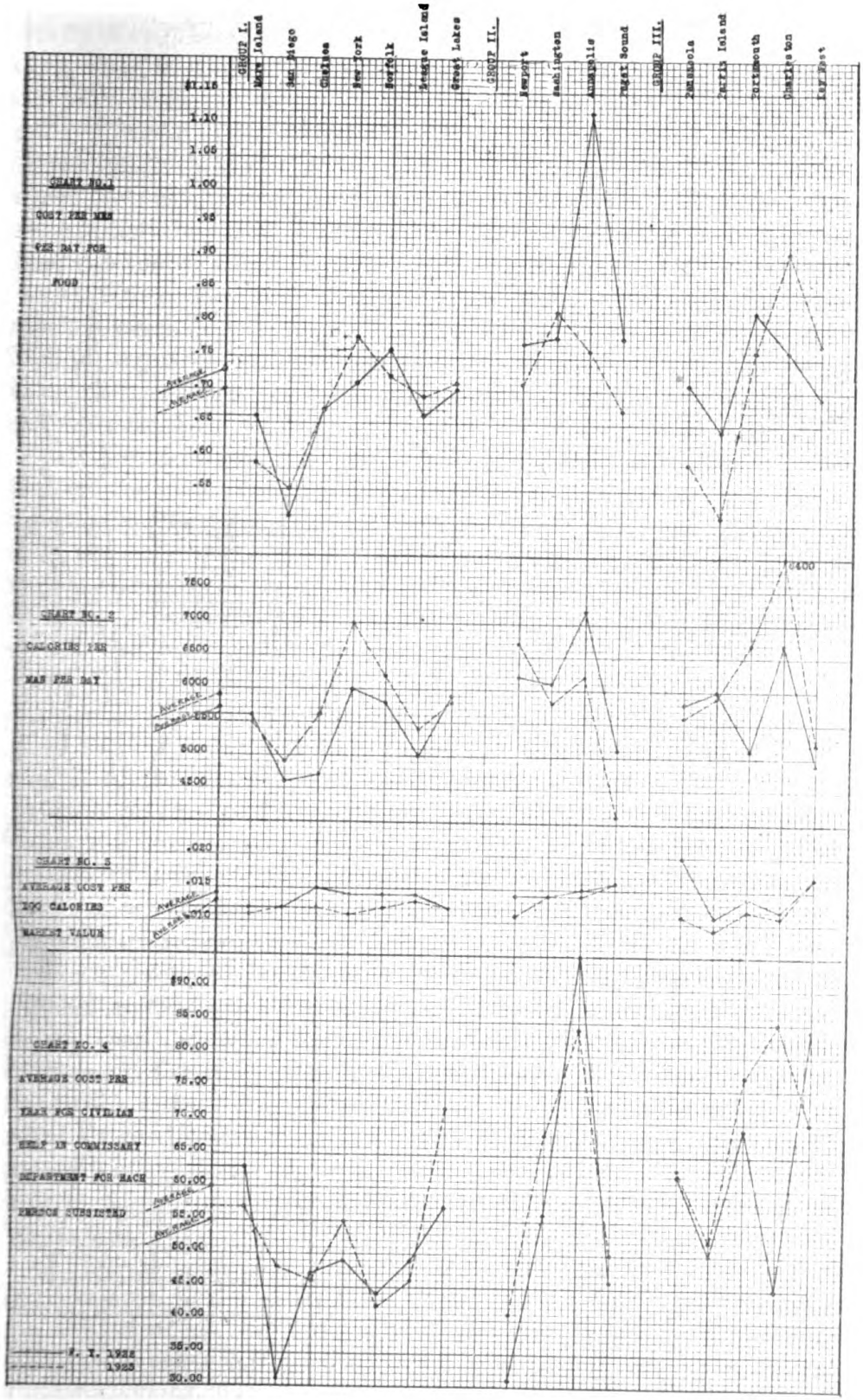
Meats.—The New York hospital had the highest rate in Group I for meats, over 1½ pounds per patient per diem, while the lowest, San Diego, practically 1 pound per day. The lowest rate for meats was at Parris Island, approximately one-half pound, which apparently met the requirements, the caloric value being kept up by carbohydrates.

Flour, wheat, products, and potatoes.—The use of these articles of diet appear to be complimentary to the amount of fresh vegetables used.

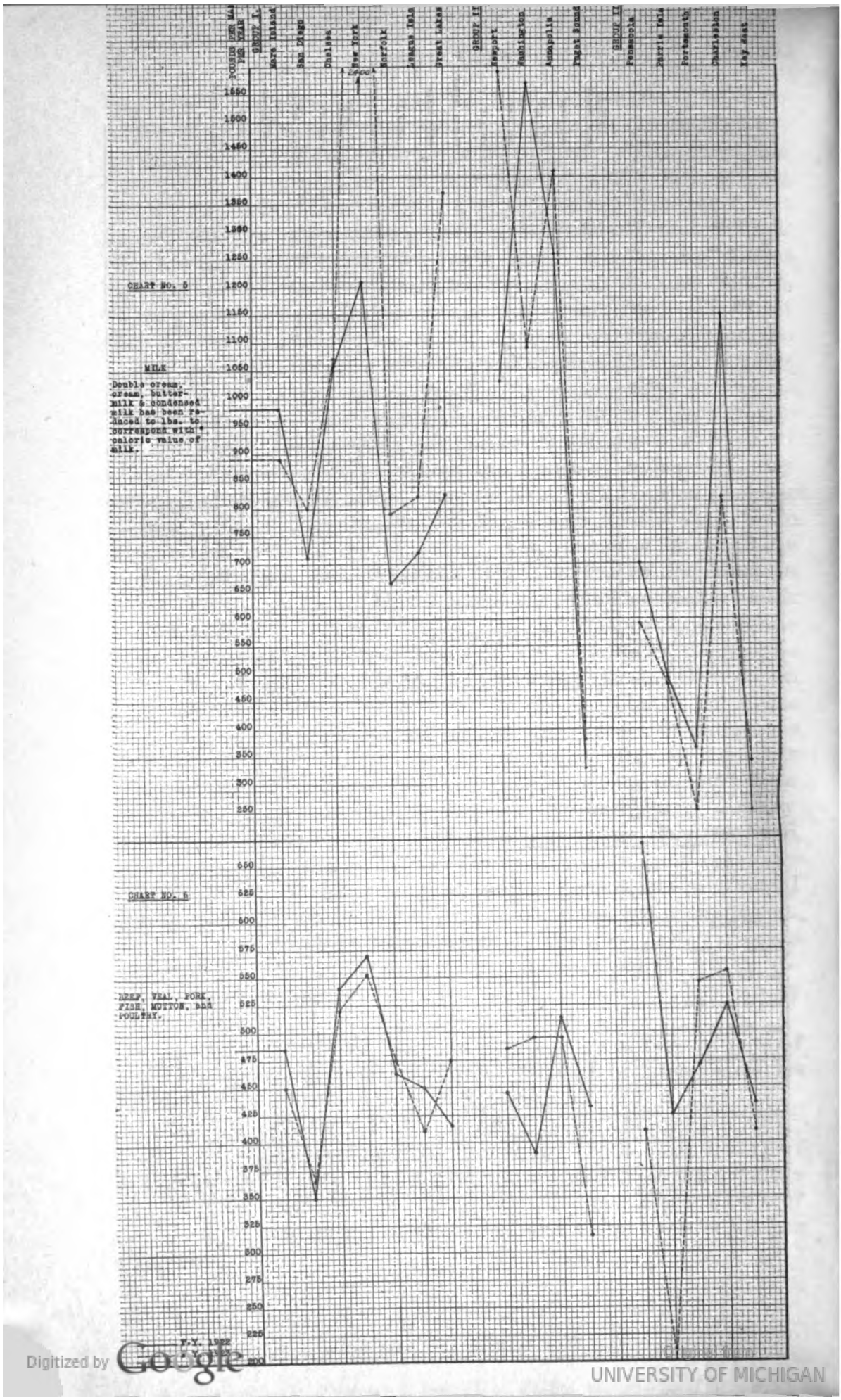
5. Comparison of graphs by groups:

Group I.—(*a*) Naval hospital, San Diego, Calif. The dietary of this hospital, with the market prices unchanged from the previous year, shows a slight rise in caloric value due to increased issue of the principal constituents of the ration, and a slight rise in the per diem cost.

Digitized by Google Original from UNIVERSITY OF MICHIGAN



Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Digitized by Google
UNIVERSITY OF MICHIGAN

(*b*) Naval hospital, Mare Island, Calif. With an average market cost, there is lessened per diem expenditure of food and a reduction of $0.07 in ration value, apparently due to a judicious selection of food; lowered proteid feeding.

(*c*) Naval hospital, Chelsea, Mass. Market costs lowered, but is offset by an increased amount of food purchased, the ration value remaining the same. The milk issue is practically unchanged; meats lowered; slight increase in the use of eggs.

(*d*) Naval hospital, League Island, Pa. As above, a lower market price has been met by an increase in the amount of food bought, apparently due to increased issue of milk or cream. The issue of meat has been markedly lowered, and is below most east coast hospitals.

(*e*) Naval hospital, Norfolk, Va. This hospital shows a reduction in the cost of ration amounting to $0.04, but also has the advantage of lowered contract prices. There is an increase in the caloric value of the already excessively high ration. This increase in calories is not traceable to any one class of foods, which would indicate a general loss possibly due to the nonuse of the cafeteria service, which is generally employed in the other hospitals.

(*f*) Naval hospital, New York, N. Y. With a lowered market the cash value of the ration has increased $0.07, due to excessive issues of milk, cream, meats, and flour products. The caloric value of the ration is far in excess of any requirement.

(*g*) Naval hospital, Great Lakes, Ill. The cost of food, the caloric value and valuation of the ration are practically the same as during the previous year. As compared with others of this group, the market costs and the caloric value are about the average. The cost of commissary service is very high.

Group II.—(*a*) Naval hospital, Puget Sound, Wash. With the highest market price for foods and slightly increased over the preceding year, the cost of the ration has been reduced $0.11, accompanied by a marked decrease in calories purchased. The nutritive value of the ration closely approaches that believed to be suitable for a hospital of medium activity, and may well serve as a model. The amount of milk, meats, eggs, and carbohydrates is moderate but ample, being supplemented by a liberal issue of fresh fruits and vegetables.

(*b*) Naval hospital, Annapolis, Md. This hospital shows a most marked drop in the ration costs, from $1.17 to $0.81, due slightly to lower food prices, but evidently largely due to less food expended, the caloric value falling from 7,200 to 6,215. The graphs indicate a more moderate issue of all classes of foods except milk.

(*c*) Naval hospital, Washington, D. C. This hospital, with an average market price practically the same as 1922, shows a decrease in ration caloric value, and an increase in ration cost. The issue of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

milk has been decreased, but the amount of meat used is high—above the average. Apparently high cost is due to expensive food articles issued.

(*d*) Naval hospital, Newport, R. I. This hospital shows a fairly low market and ration price but a high caloric value, which is traceable to an increased use of milk, meats, eggs, and carbohydrates. There was a marked fall in the amount of butter used as compared with 1922.

Group III.—Conditions under which these hospitals operate are so varied or abnormal that no remark will be made other than to invite attention to the excessive cost of the ration and the abnormally high caloric value at Charleston, and to contrast this with that of Parris Island, where an ample ration is served at a cost of $0.56. Some of this low cost is traceable to a low price of provisions.

6. In conclusion, the bureau desires to invite attention to the fact that what economy has been effected in the administration of the commissary at the various hospitals has occurred in the smaller hospitals, and that the savings would have been much more had there not been unduly high rationing in some of the hospitals of major activity. It is a well-recognized fact that it is possible to ration a large number somewhat more economically than a small number. There is evident at many hospitals an increasing attention given to the commissary department, and it is believed that by careful supervision on the part of those responsible, unless there be a notable increase in the purchase price, the cost of the hospital ration during the current fiscal year can, without detriment to the personnel, be so reduced as to effect a total saving of $150,000. On the part of this bureau it is purposed to give those officers detailed and showing capability as commissaries more opportunity to acquire special instruction in their duties. Under present instructions the chief nurse at each hospital is given the supervision of the special diets. This in a measure removes the operation of the diet kitchens from the control of the commissary officer, and the best efforts on the part of either the commissary officer or the dietitian may be offset by inefficiency, extravagance, or indifference on the part of the other. For efficiency, there must be cooperation, and in the ultimate analysis the responsibility rests with the commanding officer.

E. R. Stitt.

Circular letter. WMK:MFD 125660(102).
Serial No. 289–1923.

Washington, D. C., *October 12, 1923.*

To: All medical officers.

Subject: Reprints of the bureau's circular letters for office files.

1. The bureau's circular letters issued since the appearance of the last edition of the Manual of the Medical Department were reprinted

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in the United States Naval Medical Bulletin of October, 1923. Reprints of these circular letters and of those which will appear from time to time in forthcoming issues of the bulletin will be sent to all ships and stations for office files.

2. As these circular letters contain information of importance in connection with the administration of the Medical Depatment of the Navy, the bureau directs that a file of these reprints be kept in the main office of the medical department of all ships and stations where it shall be available for the use of Medical Department personnel.

E. R. Stitt.

Circular letter. SDS WHM-HCM 124842(103).
Serial No. 290–1923.

Washington, D. C., *15 October, 1923.*

To: All medical officers.

Subject: Additional data required on the Form F card in all cases of injury.

1. In order to increase the value of injury statistics, the following plan will be adopted January 1, 1924. This will require little or no additional work except the typing of three short statements on the back of the Form F card in every case of injury or poisoning. The information necessary for this purpose, practically, will have been obtained by the medical officer in order to write up the case properly in the health record.

2. Many injuries occur in the naval service while the individual is on leave or liberty. In such cases there is no immediate connection with the work of the Navy. In other cases, although the injury occurs on board ship or within a naval station, the injured person is not engaged in any form of work and not actually performing any particular kind of duty at the time. He may be resting, playing, or skylarking. Often, in such cases, the injury is properly recorded as having originated in line of duty. The statement of origin refers only to pension status and does not go far enough for statistical purposes. If the Form F cards are to have full value in revealing the relative importance of different kinds of accident hazards and in suggesting the need of preventive measures, the data given thereon must first of all permit proper classification. The cards must contain the information that will make it possible to separate the statistics for injuries received ashore, where very likely the hazards were not different from those experienced by civilians. A distinction must be made between injuries where a true occupational hazard is involved and others which, although occurring on board ship, do not actually depend upon the performance of any particular kind of work or duty.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

In other words, statistics compiled from Form F cards have not been satisfactory for the study of conditions and circumstances surrounding injuries in the Navy. Therefore, in addition to the key letter heretofore used on the face of the card it will be necessary to require three brief statements numbered 1, 2, and 3, on the back of the card, supplemented by further remarks if deemed necessary. The chart presented below indicates the facts desired and it shows the exact words which must be used in every case of injury and likewise of poisoning, to give those essential facts; i. e., circumstances under which the injury occurred. The words to be used are underscored or indicated in parentheses.

3. Key letters are to be used on the face of the card as heretofore. They are required primarily for translation of injuries into terms of the International List of Causes of Sickness and Death.

4. In addition to the key letter the specific cause of the injury or of the accident resulting in injury, hereinafter spoken of as the "causative agent," must be stated on the face of the card. To facilitate classification for statistical purposes the attached alphabetical list of causative agents has been prepared for the guidance of medical officers. The title "Others: Specify" has been provided for causes not found herein; a suitable term will be substituted for these words. If necessary for accuracy or clearness, titles on the list may be combined.

5. This required additional information will not be reported on Form F (smooth).

6. However, it must be entered in the health record as a part of the medical history of the case for the information of other medical officers in case of readmission.

7. The scheme may be summarized as follows:

CONDITIONS AND CIRCUMSTANCES OF OCCURRENCE, ALL INJURIES.

Report on the face of the Form F card:

Causative agent.
Key letter.
Specialty letter.

(No change has been made in the practice so far as the face of the card is concerned, except that an approved list of causative agents is now furnished by the bureau.)

Report on the back of the Form F card:

Classification "A."—

1. Whether within the command or on detached duty when injured.
2. Whether or not connected with work or actual performance of duty.
3. Negligence factor.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Classification "B."—

1. Whether on leave, liberty, or unauthorized absence.
2. Whether or not intoxicated at the time.
3. Misconduct factor.

It will be seen that every injury must come either under classification "A" or "B." These two divisions are separate and distinct. If the man was at work or actually engaged in the performance of some form of duty at the time of the injury, all the information for the required three statements will be found indicated under classification "A." If, on the other hand, the injury was received while on liberty, the required three statements will be prepared in accordance with the outline shown under classification "B."

The attached chart shows exactly what information must be furnished.

8. Examples:

(*a*) Injury on board ship due to the bursting of gauge glass on one of the boilers.

Report:

(On face of Form F card.) Wound, lacerated right eye and face. Explosion of gauge glass. Key letter "H."

(On back of Form F card.)

1. Within command.
2. Work.
3. Faulty material and lack of safety device.
4. Brief remarks, if any.

(*b*) Injury ashore in an automobile accident while on liberty.

Report:

(On face of Form F card.) Fracture, right radius and ulna, simple. Automobile. Key letter "L."

(On back of Form F card.)

1. Liberty.
2. Intoxicated.
3. Result of own misconduct.
4. Brief remarks, if any.

(*c*) Injury of mail orderly ashore in street railway accident.

Report:

(On face of Form F card.) Wounds, multiple, lacerated, about head and face. Street car. Key letter "I."

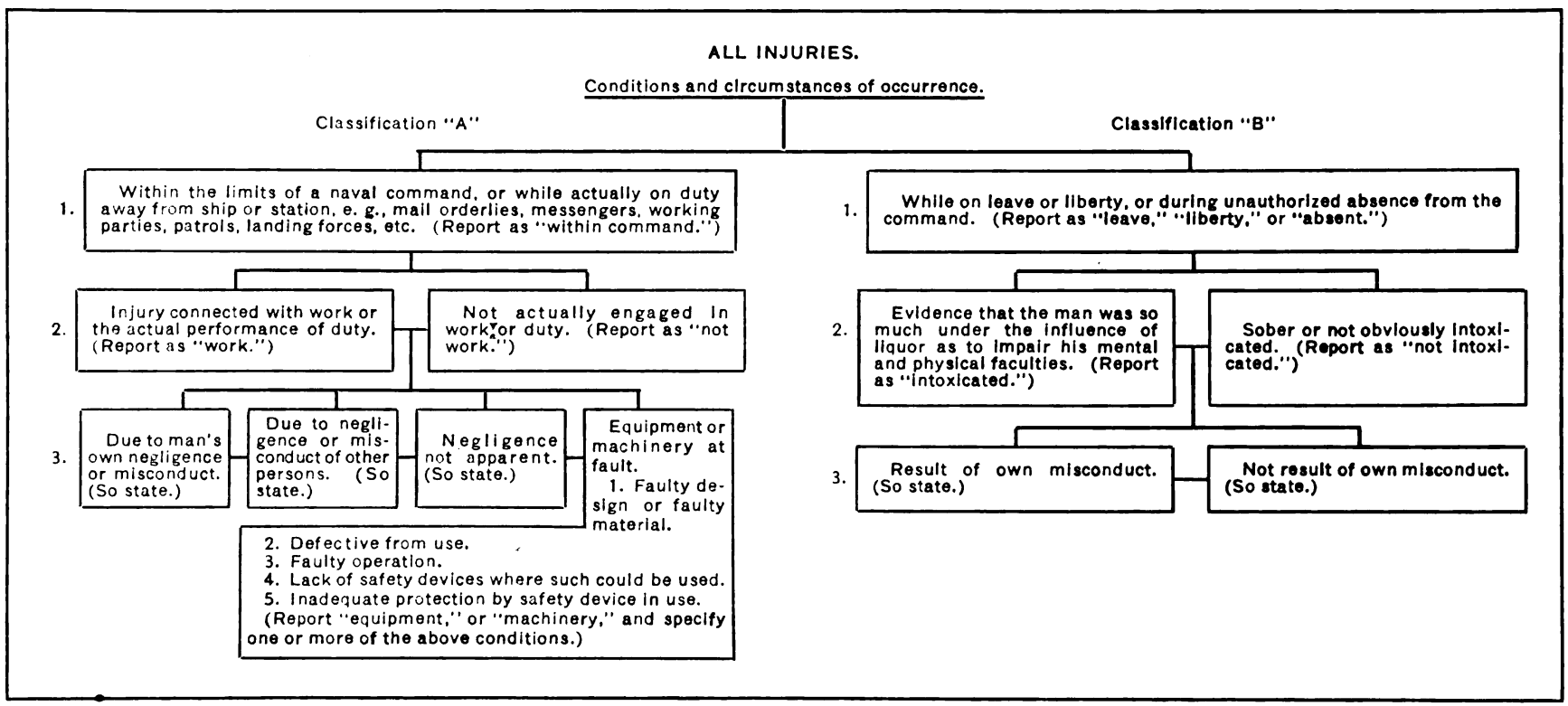
(On back of Form F card.)

1. Within command.
2. Work.
3. Negligence of others.
4. Due to broken glass in street car accident.

The latter is an example of the value and use of brief remarks. It will be seen that in this case all required data were correctly given yet the nature of the accident was not apparent.

E. R. Stitt.

Digitized by Google Original from UNIVERSITY OF MICHIGAN



Digitized by Google
Original from UNIVERSITY OF MICHIGAN

APPROVED LIST OF CAUSATIVE AGENTS.

Animals. Specify.
Aerial bombing.
Airplane (if crash, so state). (Not to include seaplane.)
Athletics, other. Specify.
Automobile, passenger.
Automobile, truck.
Balloon.
Baseball.
Bayonet.
Blank cartridge.
Blow torch.
Boats, power.
Boats, handling of. Other than power boats.
Boxing.
Cargo hatch.
Cargo sling.
Chemical. Specify.
Club.
Coaling ship.
Cold, excessive. State nature.
Collision of ship.
Conflagration. Specify.
Cutting and piercing instrument, other. Specify.
Depth charge.
Dirigible.
Drilling, except great guns.
Drilling, great guns.
Drug. Specify.
Electric current.
Emery wheel.
Electric generator.
Electric motor.
Explosion of. Specify.
Fall of material or thing. Specify:
Fuel oil.
Fighting, general. (Brawl with another person in naval service.)
Fighting, general. (Brawl with person not in naval service.)
Flaming liquid (war).
Flareback (oil burners).
Football.
Gauge glass.
Gas (war). Specify.
Gasoline.
Glass.
Grounding of ship.
Hammock, fall from, accidental.
Hammock, fall of, due to defective ropes, clews, or billets.
Hand grenade.
Handling stores, other than explosives and projectiles.
Handling of explosives and projectiles.
Handling of material.
Hatchway and ladder.
Heat, excessive. State nature. (Sun, engine room, etc.)
Hot liquid. Specify.
Jumping.
Lacrosse.
Land mines (war).
Land or snow slide.
Lifting.
Lightning.
Lines and cables.
Machinery. State kind.
Marching. (Not to include ordinary drill.)
Mess table.
Mines, laying or sweeping of.
Motor cycle.
Nail.
Others. Specify.
Parachute.
Pistol (revolver) ball.
Railroad accident.
Rifle ball.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Saber.
Sea or hydroplane (if crash, so state).
Shell.
Shell fire.
Shoes, ill-fitting.
Shrapnel.
Sinking of ship by. Specify.
Sinking of submarine due to defective mechanism.
Skylarking.
Slice bar.
Slipping.
Splinter.
Staging (also boatswain's chair).
Steam.
Stone.
Storm at sea.
Storm on land.
Street car.
Stumbling.
Swimming.
Tank.
Target practice, small arms.
Target repair party, great gun practice.
Torpedo.
Tractor.
Vehicle, other. Specify.
Wrestling.

Circular letter. WEE:SS 124680(103).
Serial No. 291–1923.

WASHINGTON, *October 19, 1923.*

To: All medical officers of ships and stations.
Subject: Health records retained in files.

1. It has come to the attention of the bureau that health records are being retained in the files on board ships and at stations, not only when men have completed their enlistments but also when they have been discharged from the service for other reasons, or have been transferred.

2. This practice has resulted in the loss, or absence, of the health records not only on board ships and at stations but in the Bureau of Medicine and Surgery where they are required for the best interests of the Government; it has also resulted in the preparation of duplicate records which are frequently incorrect and which unnecessarily fill the files.

3. It is therefore directed that all medical officers shall immediately check over all health records in their custody, and that all records shall be forwarded, when necessary, to this bureau or to the ships or stations to which it may be ascertained the individuals have been transferred.

E. R. STITT.

In spite of stringent laws governing the distribution of habit-forming drugs, the fact that they may be procured easily by the initiated addict is often brought to notice in an unexpected manner. The

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

following letters concerning a preparation, the indiscriminate sale of which should be prohibited by law, are self-explanatory.

From: Commanding officer, hospital station.
To: Commandant, fifth naval district.
Subject: Wampole's hypno-bromic compound.
Inclosure: 1 sample.

1. I am sending you an ounce bottle of Wampole's hypno-bromic compound. This was taken from an enlisted man at Dell's locker room, opposite the naval Y. M. C. A., Norfolk, Va., by an acting petty officer of the hospital station. He saw this enlisted man about to drink the contents of this bottle and forcibly took it from him. The identity of the enlisted man and his station are not known.

2. It appears that the use of this compound is very general among the men of this district, and is known by them as "concentrated alcohol." It apparently can be bought in any amount by the men. It is perhaps needless to say that this is a highly poisonous compound, and 1 ounce might cause the death of two or possibly three men. * * *

(Signed) GEORGE PICKRELL.

From: Bureau of Medicine and Surgery.
To: Base medical officer, United States naval operating base, Hampton Roads, Va.
Subject: Wampole's hypno-bromic compound; analysis requested.
Reference: (*a*) Letter from Capt. George Pickrell (M. C.), United States Navy, to commandant, fifth naval district, dated 17 October, 1923.
(*b*) Letter from base medical officer to Bureau of Medicine and Surgery, #124920 (103), dated 20 October, 1923.

1. The justification for Captain Pickrell's letter of warning will be found on page 430 of The Propaganda for Reform in Proprietary Medicines, volume 2, 1922, American Medical Association, which reads as follows:

"A physician in Vermont writes:

"'This is simply a word of inquiry—and of possible warning to other practioners—regarding a preparation known as hypno-bromic compound manufactured by H. K. Wampole & Co. This compound is dispensed by druggists without prescription and contains in each ounce:

	Grains.
Cannabis indica	1
Morphine	¼
Potassium bromide	48
Hyoscyamus	1
Chloral hydrate	96

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"'I have at the present time three young women who are addicts to this preparation as the result of thoughtless prescriptions from physicians. This mixture evades the working of the Harrison Act and may be dispensed freely at the discretion of the druggist and, as a result, these three cases of mine have been able, by visiting at the various drug stores in town, to keep an ample supply on hand at all times.'"

Hypno-bromic compound is more than an unscientific mixture; it is a dangerous product and should not be sold indiscriminately over the drug counter. Before the Harrison narcotic law went into effect, hypno-bromic compound contained half a grain of morphine sulphate to the ounce instead of its present one-fourth grain. Physicians remember that section 6 of the Harrison law contains a joker—put over by the "patent medicine" interests—that exempts proprietary remedies containing one-fourth grain of morphine or less to the ounce from the restrictions of that act. While it is illegal for a physician to write a prescription which contains morphine, no matter how small the amount, unless he conforms in all ways to the requirements of the Harrison narcotic law, "patent medicine" concerns can sell indiscriminately nostrums containing morphine up to this amount and the public can buy them without let or hindrance. No reputable druggist would sell a layman over 700 grains of chloral hydrate or 2 grains of morphine or 8 grains of extract of cannabis indica without a prescription, yet, the druggist may hand over 8-ounce bottles of hypno-bromic compound, which contain 768 grams of choral hydrate, 2 grains of morphine sulphate, 8 grains of hyoscyamus, and 384 grains of potassium bromide. Physicians who prescribed such products as hypno-bromic compound and druggists who indiscriminately sell such stuff are disgracing two honorable professions. (From the Journal, A. M. A., Feb. 7, 1920.)

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

BOOK NOTICES.

Publishers submitting books for review are requested to address them as follows:

The Editor,
United States Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.
(For review.)

Books received for review will be returned in the absence of directions to the contrary.

DISEASES OF THE SKIN, by *Richard L. Sutton, M. D., LL. D., professor of diseases of the skin, University of Kansas School of Medicine.* Fifth edition, C. V. Mosby Co., St. Louis, 1923.

The first edition of this well-known work appeared in 1916. The author, one of the most indefatigable workers in the field of dermatological research, at that time aimed to present the entire subject of dermatology in a comprehensive and concise manner. That he succeeded in his attempt is made evident by the popularity of the work, necessitating five editions of the book since its first appearance.

The present volume is an admirable exposition of the author's ability as a teacher of dermatology. All recognized dermatoses are discussed in a logical manner according to their relative importance and frequency. As in former editions, particular emphasis has been placed on differential diagnosis, pathology, and treatment, making the work especially valuable to the general practitioner. A notable feature is the inclusion of over 1,000 photographic illustrations, among which are some noteworthy photomicrographs, the work of the author's son, Richard L. Sutton, jr. These, with some exceptionally realistic colored plates, present a complete pictorial record of the diseases of the skin.

MANUAL ON SHIP SANITATION AND FIRST-AID FOR MERCHANT SEAMEN, by *Robert W. Hart, passed assistant surgeon, United States Public Health Service. Prepared under the direction of the Rev. Archibald R. Mansfield, D. D., superintendent Seamen's Church Institute of New York, in cooperation with the United States Public Health Service, Washington, D. C.* Second edition. Seamen's Church Institute of New York, 1923.

This manual has been prepared to meet the need of seafaring men, who will find in it much valuable information on general ship sanita-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tion and hygiene and on the common medical and surgical conditions which occur on shipboard, together with clear directions for the treatment of diseases and the care of injuries. As some merchant ships are often long at sea without a doctor on board, the author has included in this book practical information concerning bedside nursing and instructions which will enable the sailor to cope with those medical and surgical emergencies which frequently arise at sea.

Sanitary conditions on merchant ships are often not all they should be, due not so much to willfulness as to ignorance regarding even the most elementary rules of sanitation and hygiene; therefore it is pleasing to note that the manual opens with a clear and practical discussion of general sanitation and hygiene as related to conditions on shipboard. This is followed by chapters on anatomy and physiology, the ship's sick bay and medicine chest, medical first aid and surgical first aid. An appendix contains excerpts from Regulations, United States Public Health Service, and from the latest United States navigation laws, with which every seaman should be familiar.

The Seamen's Church Institute of New York deserves great commendation for the unique service it renders to sailors of all nationalities who visit the port of New York and especially for the preparation of this manual, which should be in the sea bag of every member of the American merchant marine.

PRINCIPLES OF BACTERIOLOGY, by *Arthur A. Eisenberg, A. B., M. D., director of laboratories, St. John's Hospital, pathologist to Lakeside Hospital, and serologist to St. Ann's Hospital, Cleveland, Ohio.* Second Edition. C. V. Mosby Co., St. Louis, 1923.

This compact little volume was first prepared by the author as a textbook for the use of the nurses of St. Vincent's Charity and St. John's Hospitals, of Cleveland. It represented, with some additions, the syllabus of lectures delivered by the author at the training schools of these hospitals. Designed for nurses, the book was written in very similar language, incorporated all the established facts of bacteriology, and stressed the principles of bacterial prophylaxis.

As there is an ever-present need for nurses capable of serving as laboratory assistants and technicians, the author gave a minute description of the simpler technical procedures and cultural diagnosis. The book proved to be useful and popular and the first edition was soon exhausted.

In the preparation of the second edition the author has included many additions to our knowledge of bacteriology which have been made during the past five years. Among these one notes a discussion of D'Herelle's phenomenon—one of the most important contributions

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to bacteriology since the days of Ehrlich and Bordet—descriptions of some of the newer technical procedures, such as Paltouf's modification of Gram's method of staining, Pappenheim's method and some culture media, a description of the newer precipitation and flocculation tests for the diagnosis of syphilis, a discussion of the new colorimetric method of titrating culture media, a description of the pretransfusion blood tests, including a discussion of the blood typing of Jansky and Moss, and a discussion of anaphylaxis, Besredka's desensitation methods, and the application of anaphylaxis to the diagnosis of hay fever and bronchial asthma.

HABITUAL CONSTIPATION, ITS CAUSES, CONSEQUENCES, PREVENTION, AND RATIONAL TREATMENT—SET FORTH IN NON-TECHNICAL LANGUAGE, by *Ismar Boas, M. D., professor of medicine in Berlin.* Translated by *Thomas L. Stedman, M. D.* Funk & Wagnalls Co., New York, 1923.

Medical writers in recent years have turned their attention to the problem of educating the public in medical matters with a view to decreasing pathological conditions which may be avoided by one possessing a knowledge of them. As indicated by the title page, this book on habitual constipation, which affects all classes and all ages, is written for the general public. The treatment of constipation, as the author makes clear to the reader, belongs to the province of the physician; but the management of a case "presupposes an understanding of the nature, the causes, the consequences, and the complications of the disease. And, further, since prevention and a rational treatment can not be carried out successfully without the cooperation of the patient, he must have such knowledge as to supplement the physician's advice and render it intelligible."

The book is written with this end in view. Ordinarily constipation is a subject difficult to present to the lay reader, but in this instance both author and translator have handled it in an admirable manner.

OBSTETRICS FOR NURSES, by *Charles B. Reed, M. D., obstetrician to Wesley Memorial Hospital, Chicago, Ill.* Second Edition. C. V. Mosby Co., St. Louis, Mo., 1923.

In this book the various processes of midwifery are presented with that fullness of information, conciseness of expression, and emphasis due to important subjects which characterizes the author's courses of instruction in the training school for nurses with which he is connected. In addition to the chapters which deal with pregnancy, labor, and the peurperium, there are excellent chapters on the care of the child, infant feeding, cleanliness and sterilization, diets and formulæ, and therapeutics.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A TEXTBOOK OF CHEMISTRY FOR NURSES by *Fredus N. Peters, A. M., Ph. D.* Second edition. C. V. Mosby Co., St. Louis, Mo., 1923.

This is the story of the science of chemistry told in a simple manner by one who has devoted many years of his life to teaching chemistry. The book begins with a consideration of substances familiar to all and leads up to those not so well known. The author has avoided the extremely technical, and chemical theory has been introduced only when it would add greatly to the understanding of the phenomena under discussion. The volume will be found useful to the hospital corpsmen of the Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE.

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge.

Notes on Preventive Medicine for Medical Officers, United States Navy.

THE PNEUMONIA, BRONCHITIS, AND TONSILLITIS SEASON: HOUSING, VENTILATION, AND CONTACT.

By J. R. PHELPS, Lieutenant Commander, Medical Corps, United States Navy.

During the winter months climate and weather make it necessary to live almost altogether indoors under shut-in conditions in various parts of the United States where health conditions among the people directly or indirectly affect the health of a very considerable percentage of the naval personnel. The principal effect, of course, is upon the prevalence and spread of the common infectious respiratory diseases and the other communicable diseases, including the acute exanthemata, which are transmitted by mouth and nose secretions. Unhygienic housing conditions are definitely responsible for a considerable part of the seasonal increase in the prevalence of these diseases. Changeable climate, cold weather, wet weather, and variable weather need not cause disease and frequently do not where living conditions and the habits of the people do not lead to herding indoors.

Of course, it is the weather primarily that drives people indoors. After they have taken up the winter routine of social and business life, bad habits of personal hygiene, it may be argued, are largely responsible for illness. The demand for an excessive amount of artificial heat and the wearing of unnecessarily thick clothing next to the skin when practically the entire day is to be spent in overheated buildings are matters of personal habit, to be sure, but matters of personal hygiene can not always be separated from the subject of housing. The regulation of heat and ventilation more often than not are beyond the control of the individual. Furthermore, the whole question of the free exchange of mouth and nose secretions is intimately related to housing and housing conditions. Increased hazards of infection are naturally of interest to the individual; in a larger way, they concern the community.

Year after year a regular cycle of increasing morbidity and mortality goes on, the measurable increase beginning several weeks after

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the shut-in conditions of cold weather begin. Death rates are elevated considerably in December; they increase sharply in January and February and begin to fall decidedly in April. The various causative agents of respiratory diseases are transferred from person to person with increasing regularity and frequency throughout the bad health season—in small groups here and in large groups elsewhere. With the rapid transfer of microorganisms which have previously found lodgment in more or less susceptible noses and throats, wherein they have been able successfully to invade the tissues and produce infections of various degrees, the virulence of the prevailing types of organisms increases steadily to the height of the season. Travel from city to city and congregation of large numbers of people in theaters, in places of business, etc., from all parts of the community, facilitate the passage of microorganisms of elevated virulence from one large or small group to another. Thus, so far as the causative agents and their carriers are concerned, we have the makings of the regular winter epidemics.

These events lead to vicious circles of increasing virulence and a tendency to increasingly serious grades of infection, followed in turn by still greater virulence of microorganisms scattered by persons later infected. On the other hand, natural laws are also at work to bring about the immunization of human hosts, or at least to insure survival of the immunologically fit. Barriers against the spread of these diseases thus appear and become increasingly effective as the season wears on in all communities where infection prevails, more or less, it seems, in proportion to density of population, size of the community, and the extent and degree of mingling among the people. Undoubtedly mass immunity has a great deal to do with keeping death rates from respiratory diseases low, and probably morbidity rates are also affected.

Attempts artificially to immunize large numbers of healthy persons against pneumococci and other organisms that cause infections of the respiratory tract have not resulted in measurable success, and at first thought it appears that health officials are powerless to do anything that will affect the introduction, the occurrence, or the spread of these diseases. Little or nothing can be done under ordinary circumstances to keep the causative agents out of the community. Travel, business, and social relations must go on. The occurrence of disease can be affected more or less by educational measures if carried on during the dangerous season with sufficient intensity and thoroughness to keep before the minds of the people (1) matters relating to personal hygiene that seem to have a bearing upon resistance and susceptibility, (2) the meaning of good ventilation and the effect of bad housing conditions upon the preva-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

lence and spread of disease in the community, and (3) personal measures that are necessary to check the spread of disease-producing organisms by direct and indirect contact and by means of the droplet spray.

Personal hygiene.—Conflicting opinions are readily evoked by a discussion of what is meant by good habits of personal hygiene. Of course, this subject offers a splendid field for faddists and all sorts of refinements in definition are possible. Many fastidious customs and habits are doubtless desirable from certain limited viewpoints or for social reasons. Also, when the discussion comes to such things as clothing, diet, and exercise, the personal equation looms large and what is one man's meat may very likely be another's poison.

Apart from such considerations, there are certain general principles covering the reactions of individuals to their environment that should receive particular attention from the standpoint of community health during the bad health season.

In the Navy, as elsewhere, something can be accomplished by so-called public health education, which usually means the dissemination of information as free from controversial opinion as it can be made. Constant reiteration of fundamental rules of health is necessary if the method is to carry with it much or anything of real educational value.

But in the Navy it is possible and indeed necessary to go much further than this, for naval organization and routine activities require modification of personal habits, comparatively close supervision of the men, and a great deal more in the way of regulation of living conditions and habits than is possible in civil institutions, not to mention the general public. At the same time, when the particularities of living are administratively regulated for numbers of individuals in groups, certain potential dangers are liable to creep in. These dangers must be kept in mind by the medical officer, who in his capacity as advisor to the administrative heads of the organization in health matters can correct or have corrected, as a rule without serious interference with necessary service activities, many of the conditions which may involve avoidable health hazards. For example, the bluejacket has little choice in the matter of clothing; ordinarily, he must wear the uniform of the day. If he falls in on the upper deck at quarters without a sweater or overcoat and is kept standing at attention or at ease shivering in a cold wind while various parts of the ship are being inspected, how can it be logically maintained that no chances are being taken with his health? At the naval training station, Great Lakes, Ill., during the World War many thousands of recruits were sometimes assembled in parade formation

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to receive a distinguished visitor and were then kept waiting in line by delay in his arrival. The morbidity statistics of the station indicated that such occurrences were followed by a definite increase in the incidence of respiratory diseases, including pneumonia. Again, if the men are not given opportunity to change their clothing promptly after a wetting, and often if they are not made to change, risks are taken. At home there are mothers and sisters to insist upon such things as overshoes and getting out of wet clothes. Doubtless unnecessary fuss is often made about such matters, but most men need watching or they will frequently or occasionally take chances that really have a bearing upon infection. The human body can adapt itself to a wide variation from the optimum temperature downward, but not suddenly. It is possible for man to accustom himself to going naked in the woods in extremely cold weather or to swimming in ice water. However, the average individual, when thinly clad and moist with perspiration, can not adapt himself to a sudden change from an artificially heated space into cold outside air without overtaxing the circulatory adaptability power of his mucous membranes and heat-regulating functions of his skin to a degree that is liable to lower the barriers against infection by microorganisms which, perchance, he already harbors.

Another point to be remembered is that the uniform order for the day should be sufficiently flexible or subject to timely modification where sudden changes in the weather occur, as in San Francisco, to permit the wearing of garments suitable after the change has taken place. It is necessary to plan ahead sometimes to insure adequate protection of liberty parties which are to be absent from the ship or station for several hours. More often than not the exposure of enlisted personnel to cold or wet weather without ample protection in the way of suitable garments is due to oversight or thoughtlessness rather than to stringency of orders regarding the uniform of the day. Because such details may be overlooked in the rush of the day's work and few or many men suffer in consequence, the medical officer must keep such hazards in mind and be quick to make suitable recommendations.

An important principle regarding clothing is that it should be porous and as light as may be worn comfortably at the low temperatures to be encountered, particularly the layers next to the skin. Of course, circumstances of work and exposure alter conditions. A man may keep himself aglow and comfortably warm in a light undershirt and running trunks if he keeps running. A sentry standing still or pacing a short beat must wear heavy woolen underwear and heavy outer garments when exposed to a cold wind if he is to avoid severe or dangerous chilling. When a change in the weight of under-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

wear is made according to the calendar rather than in preparation for the task of the hour and in accordance with weather conditions, the skin tends to lose its power of ready adaptability to the variations in temperature and relative humidity that are unavoidable in winter. Susceptibility to colds seems to be increased thereby. Certainly women who go about lightly clad as to underwear and protection of the throat in cold weather seem, by and large, more resistant to infections of the respiratory type than men experiencing the same weather conditions.

Much depends upon the layer of air surrounding the body. This is a blanket of warm, moist air—warmed by contact and radiation from the body and moistened by the output of the sweat glands. If the skin is to function properly and at the same time maintain proper power of adaptability this layer of air must be changed at a fairly uniform rate with considerable rapidity by ventilation through the several layers of garments to the skin. The necessary renewal of air can not take place in the comparatively still air of an overheated room through thick underwear saturated with moisture.

The subject of bathing also has its important practical considerations. Unless the men can wash themselves and bathe in properly heated spaces and have water that is not uncomfortably cold during cold weather they will not bathe regularly or as often as they should. It is all very well to say that cold water is good for them and that they are used to drafts and blasts of cold air on board ship. The average bluejacket is not very different from the average run of men; indeed, a considerable percentage of the men in any organization have so recently joined the Navy that they are not thoroughly seasoned and accustomed to service hygiene. Some men are accustomed to cold baths and are stimulated by them and enjoy them; and some, activated by ostentatious vaporings of the subconscious mind, claim that they enjoy an icy plunge or cold shower in cold weather, when in reality they do not. Most men do not, and the cold bath is likely to be harmful if the skin does not react promptly afterwards. Of course, one may become accustomed to cold water, but that is not the point. The majority of men in the group will bathe more regularly and more frequently if convenient facilities are provided where they may strip and dry themselves in a state of comparative comfort; otherwise, no.

Similar statements apply to toilet facilities. The intestines are quick to form habits, bad habits quicker than good habits, it often seems. Unless water-closet seats are available where the men may find a place and be fairly comfortable without waiting in line and without having to walk a considerable distance to get there, calls of nature are going to be neglected, and presently the habit of constipation is formed. Of course, other factors are involved, notably

Digitized by Google Original from UNIVERSITY OF MICHIGAN

an unbalanced ration lacking in cellulose and perhaps in fat; more particularly, bad habits in eating—that is, the food which the individual himself selects from the meal prepared for him and the manner in which he eats it. A fixed habit of bolting the food is bad. Deficiency in fat can not be charged against Navy messes, as a rule; on the contrary the average bluejacket is likely to eat more fat than he really needs. It is beyond the scope of this paper to discuss the diet, but it may be said that comparative deficiencies in fresh leafy vegetables and fruits among the general population, especially the poorer classes, during the winter season very likely constitute one of the factors which bear directly upon the development of the infectious diseases that have their greatest prevalence during the winter and spring. The difficulty of supplying regularly, at sea, green leafy vegetables and palatable roughage in sufficient quantity is well known. Whatever contributes to cause constipation becomes a factor in the etiology of respiratory disease by interference with the normal processes of elimination. Doubtless, by increasing the load on the kidneys, skin, and circulation a definite effect is exerted upon the delicately balanced entity that determines personal immunity. In the case of an individual habitually constipated, compensations have been made so that he usually feels as well as one whose bowels move regularly every day, and probably delay in the evacuation of the lower bowel does not particularly lower the resistance of his tissues to invasion by microorganisms. In other words, occasional or intermittent failure of the bowels is more significant than confirmed laziness.

The laundry question is an important one. The larger the crew the more important the question of sanitary washing of clothing becomes. With 1,400 or 1,500 men on board a battleship there is much congestion with close personal contact and other evils of overcrowding. These must be given great weight in considering all epidemiological factors that make for the occurrence and spread of infectious diseases of the respiratory type on board ship. The larger the group the more difficult it is to keep the men well. With increase in numbers, communicable disease hazards increase out of proportion to the numbers of men added. Large ships fortunately have laundries. The underwear, handkerchiefs, and other articles subject to contamination by body discharges and by nose and mouth secretions should be handled for the crew by the ship's laundry, where they can be disinfected by the washing process. It appears that some prejudice still exists in the service against permitting the bluejacket to profit by this ordinary and essential sanitary feature of modern civilization. The public health value of this method of systematically destroying vast numbers of virulent microorganisms on board large ships should be given more weight

Digitized by Google Original from UNIVERSITY OF MICHIGAN

than traditions which require that every bluejacket must scrub his own clothes. This is a valid public health requirement because with their large crews the menace of communicable diseases is far greater on board battleships of to-day than on board capital ships in days gone by. Incidentally sickness rates and death rates were much higher in those days than they are to-day. Low death rates and the comparative freedom from disease now experienced did not just happen to come about. The men are just as liable to get sick. The difference is due to the gradual acquisition of knowledge and its application with increasing effect. Much remains yet to be learned about the control of respiratory diseases, but we do know that proper disinfection of contaminated wearing apparel is an important public health measure.

There is something to be said about exposure incident to scrubbing clothes on deck in cold and inclement weather. The men should be watched and warned against dangerous exposure upon coming directly from heated compartments, lightly dressed, for the purpose of scrubbing clothes. Conditions on outside scrub decks particularly should be watched during the winter and spring at naval training stations. The men under training have not undergone any great degree of seasoning to such environmental influences.

Ventilation.—As a result of the work of the New York Ventilation Commission and other recent studies it is now possible to discuss this subject in simple terms. The object of ventilation is the removal of body heat, body moisture, and body odors by the constant supply and circulation of good air in sufficient quantity to accomplish all three purposes. Deleterious effects can no longer be attributed to carbon dioxide in excessive amounts or to the presence of organic effluvia.

Good air means: (1) Fresh outside air when possible, and in any event air that is cool but not uncomfortably so.

(2) Air in which the relative humidity is not excessively high in relation to air temperature in the occupied ventilated space. It is of less importance but preferable that the relative humidity, likewise considered in conjunction with room temperature, should not be too low.

(3) Air that is in motion but without sufficient movement to create a disagreeable draft; preferably motion that varies from moment to moment, accompanied by slight fluctuations in temperature—conditions which produce an agreeable and stimulating effect upon the human body. (Winslow.)

(4) Air free from offensive odors.

(5) Air free from poisonous fumes or gases.

(6) Air free from excessive amounts of dust.

We are principally concerned here with cold weather conditions. The necessity for artificial heat is presupposed. Therefore, the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

uncomfortable and even serious effects of high relative humidity in combination with high temperatures—75° to 95° F. or higher—need not be considered for the moment. Instead the air is likely to be too dry for comfort. Exaggerated statements are often made about the bad effects of excessive dryness in artificially heated air. Overheating is more likely to be the real cause of discomfort and predisposition to respiratory disease rather than the lack of moisture in the air. Dr. C. E. A. Winslow, in view of the findings of the New York Ventilation Commission, states that such results as are available in regard to the supposed harmful effect of dry air per se are almost wholly negative. The drying effect of such air is in proportion to the movement of the air. It is true that when the air is so dry as to injure leather and furniture it produces an uncomfortable effect upon the skin and causes the mucous membrane of the nose to feel dry. Naturally, the drying effect is much greater if the air is moving rapidly, as may be the case in the vicinity of furnace registers and usually is the case at considerable distances from blower terminals through which heated air is supplied at high velocity. No one has been able to make out much of a case against the hot-air furnace as a producer of disease in the home, but the more rapid movement of the air in various parts of a room or compartment where centrally heated air is delivered by a plenum system of ventilation may intensify the drying affect to such a degree as to cause marked discomfort. As a rule, this effect is associated with overheating, and probably the discomfort and certain injurious effects which have been attributed by various medical officers in their sanitary reports of conditions on board battleships heated by the combined system of plenum ventilation together with remote heating of the air, have been due to overheating and rapid movement of the warm or hot air rather than to the low relative humidity. In other words, the low relative humidity would not matter very much if the air were comparatively still. These factors can not very well be studied separately in actual practice. It is not practicable to add much moisture to the air on board ship, and such regulation as is possible becomes a matter of controlling the temperature and modifying strong currents of warm air by better distribution of incoming air. The principle here involved is that there should be small and numerous inlets, preferably one of proportionately small area (14 to 16 square inches) for each person, situated low down with outlets located overhead so as to secure the benefits of the upward system of distribution within the ventilated space. That is out of the question on board ship. It is the approved method of ventilating and heating theaters, where an individual mushroom-shaped inlet may be placed under each seat. It is possible to change the air in the auditorium every two minutes without producing

Digitized by Google Original from UNIVERSITY OF MICHIGAN

uncomfortable drafts. We start with the outside air at given temperature and given relative humidity and then raise the temperature to the point where the air will feel comfortably warm to the occupants of the space. That is the end result whether the heating be done in the space itself by steam radiators or centrally prior to distribution by the blower. The relative humidity depends entirely upon the room temperature and is the same in either case, but it can not be denied that the air is more uncomfortable when delivered by the blower at high velocity. In this case a somewhat higher temperature is necessary if the average individual is to feel comfortable. From the health standpoint, therefore, local heating by steam radiators is preferable because overheating is an important factor among the contributory causes of respiratory disease. The effect is due to the strain put upon the temperature-regulating mechanism of the body and particularly upon vasomotor control in the mucous membranes of the nose. Upon going from an overheated space into cold air the mucous membranes of the nose become pale. The tissues of the lower turbinates may or may not contract. Often the blood vessels contract, but the mucous membranes are left otherwise in adjustment for the high temperature; they remain swollen and covered with secretion. Before adjustment can take place the temporary condition of inadequate blood supply may result in lowering the local barrier against invasion by disease-producing microorganisms. Studies in New York seemed to indicate quite definitely that overheating of schoolrooms was responsible for a higher incidence of respiratory disease among the pupils in overheated rooms than among children in rooms were care was regularly exercised to prevent overheating.

Rooms in which a temperature above 70° F. is maintained may be regarded as overheated. It is desirable not to raise the temperature above 68°, but many persons feel uncomfortable with the temperature below 70° F. unless they are working or moving about. Much depends upon the relative humidity and air movement. If the relative humidity can be kept up to 30 per cent and excessive movement is avoided, lower temperatures will be found comfortable.

Natural ventilation is preferable. Where the fresh outside air can be taken in naturally through windows equipped with glass ventilator plates of the Fairfield type set at an angle to deflect the incoming cold air upward, with a steam or hot-water radiator beneath the window to assist in dispersing the cold air, it is possible to maintain more wholesome air conditions than can be secured with forced ventilation. The air feels better to the skin because the temperature fluctuates a little, and the rate of movement is also variable as the air circulates through the room; cross currents vary in intensity from moment to moment. Thus, the skin and mucous membranes are

Digitized by Google Original from UNIVERSITY OF MICHIGAN

agreeably stimulated and the air feels pleasant, more like outside air. The uniform rate of change with the plenum system is not so good, but, of course, many rooms and compartments can not be ventilated by natural means. The next best thing is to combine natural ventilation with the plenum supply if it can be done. It is often possible to do this to good advantage in office buildings, schoolrooms, hospital wards, and in some compartments on board ship. Sometimes natural openings can not be used without serious intereference with the efficiency of the mechanical system. For example, in a theater the blower supply frequently fails to change the air uniformly if the doors are left open. The air then becomes overheated in certain parts of the auditorium, pockets form, and strong drafts are set up elsewhere.

Where forced ventilation must be used, it is desirable in cold weather to distribute the incoming air, if heated, through many small rather than one or two large terminals. If terminals can not be located in the floor or deck, the hot air should enter the space as low as possible and be directed downward to be dispersed over the floor before it rises. Cold air should be delivered high so that it will be diffused overhead before it sinks. Local conditions in each compartment, of course, determine how the air can best be distributed. The best attainable results can not be secured with any mechanical system of ventilation without constant attention and change of procedure to meet varying weather conditions.

The question of using venturi tubes on terminals in cold weather should be considered. By such means the incoming air, whether cold or heated, may be mixed with the room air by aspiration and thus tempered as it leaves the terminal. A cone-shaped device might also be placed in the terminal to reduce the velocity of the incoming air by directing it laterally in all directions instead of forward in one direction.

Overheating should be avoided and men should not work or sleep in the vicinity of blowers where they will be exposed to strong currents of hot air or to blasts of cold air.

Extreme conditions are encountered on board ship. In warm weather the ventilation problem resolves itself into a question of getting rid of excessive heat. Solar heat is transmitted through the metal of the ship's hull, and wild heat is transferred through bulkheads into compartments in the vicinity of fireroom and engine room spaces. Sometimes this heat is also carried by air currents into distant compartments. Volumes of air greatly in excess of amounts necessary to remove body heat, body moisture, and body odors fail to maintain comfortable atmospheric conditions. Strong currents of air are appreciated at such times, and while it is not agreeable as a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

rule to sit or work with an electric fan blowing directly upon one, conditions are so much worse without fans that they are generally kept running at full speed and often more fans than are available could be used to good advantage.

In cold and moderately cold weather the presence of wild heat is usually advantageous. Such heat furnishes agreeable warmth in living spaces, even in compartments that have hot bulkheads in them, because nearly always it is possible to regulate the amount of cold air entering the compartment. A large area of heated surface helps diffusion and tempers the air.

The standard capacity of plenum ventilating systems on board ships of the Navy is 50 cubic feet of air per capita per minute—3,000 cubic feet per hour. That seems like a liberal provision inasmuch as 2,000 cubic feet per person per hour, or even 30 cubic feet per minute, is sufficient in buildings ashore. However, this supply is often entirely inadequate in warm weather, as indicated above.

Not infrequently better results would be secured in certain locations on board ship with blowers of greater capacity than those installed. Generally it appears that most parts of the ship are well ventilated, but certain compartments are poorly ventilated. Sometimes this is due to the fact that more men must now be quartered in such a compartment than was anticipated when the ship was built. Dirt collects in fans, trunks, and ducts and on the screens of terminals so that the amounts of air delivered are often less than the calculated amounts. Motors do not always turn up to their rated speeds. Terminals should be kept clean. Blower casings are accessible, but it is not always practicable to keep the closed air lines clean. An increased supply should be made available in any living compartment which by actual experience is found to be poorly ventilated, frequently or usually, whether the unsatisfactory condition of the atmosphere is due to wild heat or to an excessive number of occupants quartered therein, provided essential service conditions preclude reduction in numbers.

The removal of wild heat by forced ventilation of the overheated living compartment is an expensive proposition. Practically, more air than is required for most ventilation purposes must be supplied, but better results can be secured by insulating heat-conducting bulkheads in conjunction with a supply of air moderately in excess of ordinary requirements. The need for heat-insulating material and a satisfactory job should be stressed in making recommendations for the correction of this sort of defective ventilation.

These warm-weather conditions have no direct connection with the almost opposite conditions which it is the purpose of this paper to discuss. But they are worth considering by way of contrast in order that the limitations of mechanical ventilation systems may be

Digitized by Google Original from UNIVERSITY OF MICHIGAN

clearly appreciated. Any installed apparatus that is capable of maintaining tolerable air conditions in warm, humid weather will furnish an adequate supply of air in cool and cold weather to remove body heat and body odors, provided the requisite amount of air is allowed to flow. That will always be the case if the occupied space is adequately heated by any means other than the heat liberated by the occupants themselves.

The capacity of the ventilating apparatus is based on the estimated number of men who will occupy the various compartments. When more men are in the compartment than the blowers were planned to take care of, the actual number of cubic feet per capita available diminishes, of course, in proportion to the increase. With double the number of occupants there is only half as much air per individual flowing through the compartment. The immediate effect of overcrowding is to spoil the ventilation. This is an inevitable result with the usual provisions, even with the plenum system. The resulting conditions are much worse in barracks, dormitories, and other large rooms ventilated by natural means. But even in a theater that is very well ventilated in fair weather, if filled only to its normal capacity, the air becomes very bad if the auditorium is overcrowded. Defective ventilation in living compartments is more serious than in spaces temporarily occupied in so far as the effects of unhygienic physical properties of the air are concerned.

There is another side to this question, and a very important one indeed. It concerns the transfer of pathogenic microorganisms from person to person in countless ways. All ways and means are included under the headings, *direct contact*, *indirect contact*, and transmission by means of the *droplet spray*.

Simply through the presence of more people in a given institution or ship than can be accommodated without lowering the standards of personal hygiene by overtaxing the facilities for idling, sleeping, eating, bathing, etc., overcrowding results in greater personal contact and increased rates of transfer of disease-producing microorganisms both by direct and indirect means. The bacteriological results of overcrowding were verified at several naval stations during the war by plating out the organisms harbored in the nose and throat among thousands of healthy recruits—at least they were free from symptoms when the cultures were made. The results of that work are well expressed in the aphorism, "Under conditions of overcrowding the bacterial flora of the nose and throat tends to become unifrom throughout the personnel."

Every health officer knows that bad housing conditions and overcrowding are together responsible for much of the communicable disease that he is trying to control. The tenement districts, overcrowded lodging houses, and districts where excessive numbers are

Digitized by Google Original from UNIVERSITY OF MICHIGAN

crowded into separate dwellings are the great breeding places for epidemics, and they serve as reservoirs of infection that keep up endemic prevalence.

H. W. Palmer, writing in Health Forum, Melbourne, Australia, notes that history is full of instances proving that the greater the overcrowding the higher the general death rate. Although overcrowding in civil life is generally due to poverty and poverty usually brings with it poor food, the conclusion is that overcrowding alone is harmful aside from the problem of poor food. Doctor Farr, of Edinburgh, reported in 1914 that improvement in housing conditions resulted in a drop in the death rate from 45 to 15 per 1,000 while the tuberculosis death rate fell from 3.8 to 0.4 per 1,000. In Liverpool under similar conditions the tuberculosis death rate fell from 4 to 1.9 per 1,000. The only improvement in each case was in housing, consequently that improvement alone was responsible for the change.[1]

In practical public health work to-day we do not give serious consideration to the idea of air-borne infection. In general, air carriage of virulent pathogenic microorganisms plays little or no part in the spread of disease beyond the 6 or 7 foot range of the droplet spray. The drops themselves and the particles of dust upon which they settle drop out of the air almost immediately. Under these circumstances the microorganisms quickly lose their disease-producing power by drying. Extensive use of the Chapin technique for isolating a case of communicable disease in an open hospital ward wherein patients ill with different communicable diseases are simultaneously being treated, has confirmed Chapin's conclusion that it is possible, although not the method of choice, to treat two or more diseases in the same room with little likelihood of cross infection. Under these conditions the ventilation must be good and there must be no overcrowding. There must be at least 8 feet of separation between centers of beds, and preferably cloth screens should be interposed between beds to block the propulsion of microorganisms by droplet sprays.

With overcrowding, the conditions are quite different. If many persons are present in the space, talking and laughing, and some coughing and sneezing, the air becomes pretty well loaded with fine spray and droplets. Under such circumstances it can not be taken for granted that individuals beyond the limits of propulsion for any given burst of spray will not breathe in particles carrying microorganisms. If ventilation is maintained by mechanical means, the air is rapidly renewed, with anywhere from twelve to thirty changes

[1] Leslie C. Frank, Public Health Engineering Abstracts, U. S. Public Health Service, Oct. 6, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

per hour. Swift currents are present here and there to carry the finer droplets for a considerable distance before they settle out of the air.

With natural ventilation the air can not be changed many times in an hour in cold weather without causing disagreeable cold drafts and perhaps lowering the temperature of the room to an uncomfortable degree. Ordinarily the limit is about six changes per hour, but much depends upon the arrangement and numbers of inlets and outlets, the presence of window ventilators, and the adequacy and location of radiators below the inlets. The amount of fresh air required for each person per hour is commonly estimated to be 2,000 cubic feet. Smaller amounts are quite sufficient under certain conditions. The lower the temperature of the outside air the less will be required for the removal of body heat and moisture. The amounts required for the removal of body odors will naturally depend upon the individuals occupying the space. Oxygen and carbon dioxide readings need not be considered. The standard, 2,000 cubic feet of air per hour, was originally based on the assumed desirability of keeping the carbon dioxide content down to 6 or 7 parts per 10,000. Winslow, in looking at the question from the removal-of-body-heat viewpoint, has shown that when the entering air has a temperature of 60° F. 2,000 cubic feet per capita per hour will be required to prevent the heat liberated by persons in the room from raising the temperature of the outgoing air above 70° F., the desired room temperature. He states that at a low estimate (that of Pettenkofer) the average adult gives off 400 British thermal units per hour. Five cubic feet of air will have its temperature raised from 60° F. to 70° F. by 1 B. t. u.

Gatewood maintained that the standard for the Navy should be 3,000 cubic feet per capita per hour. That was a wise provision, because atmospheric conditions and the numbers of persons occupying a given space are changeable, while the facilities for ventilating remain more or less constant, especially in the case of mechanical ventilation apparatus which is limited by its maximum capacity. Ashore, more windows may be opened, but there is a limit to that because with increasing numbers of occupants the cubic air space available for each becomes so little that the required allowance of air can not move through the limited space in an hour without producing a disagreeable draft when the weather is cold. In warm weather but little movement can take place anyway.

In other words, good ventilation that assumes well-conditioned air is further conditional upon the amount of free cubic space that is available to the occupants of the room or compartment. An individual can breathe rapidly moving cold air out of doors without discomfort. He can work in a diving suit with but little air space

Digitized by Google Original from UNIVERSITY OF MICHIGAN

about his body and handle his rapidly moving supply of air very well. But one can not sit about indoors with any great degree of comfort in rapidly moving cold air. In stipulating 3,000 cubic feet of air per hour Gatewood had in mind warm as well as cold weather conditions.

The subject of ventilation is closely linked with the question of personal contact and other epidemiological factors that bear upon the transfer of pathogenic microorganisms. Unless each individual has approximately 500 cubic feet of free air space, good ventilation can not be maintained by natural means alone during a considerable portion of the year. And, furthermore, unless this amount of space is provided per capita in barracks, dormitories, and other spaces used as sleeping compartments the dissemination of disease-producing microorganisms, if present, can not be controlled within limits that are shown by practical public health experience to be necessary if communicable disease hazards are not to be out of all proportion to the assumed necessity or advantage of overcrowding the personnel to meet the exigencies of war. Proportionately less risk is justifiable in time of peace. Available floor area is the important consideration from the standpoint of contact, and practically also from that of ventilation because great height of ceiling is not advantageous.

During the war practical considerations made it advisable to adopt 450 cubic feet of air space per capita as the minimum standard free air space in naval barracks. Good ventilation requires 6 to 7 renewals of the air per hour with such spacing. Economic considerations demanded a height of 9 feet in some temporary barracks. That is really ample. Epidemiological considerations demanded more floor area per individual than could possibly be secured. The absolute minimum that could be defended as a sanitary standard was 50 square feet. This standard pertains only to rooms or compartments used for sleeping purposes. The Medical Departments of the Army and Navy used every effort to prevent departures from this standard. In this they were only partly successful, and it is regrettable that the excess of morbidity and mortality resulting from such departures can not be measured.

In barracks 20 feet wide the allotment of 50 square feet to each occupant would naturally result in an area 10 by 5 feet, giving a separation of 5 feet between the centers of beds or cots. Recognizing that the tendency would be for men to move their cots or hammocks close together to clear a free space and that all free space would immediately be taken for more cots and hammocks with the arrival of more men than the building was planned to accomodate, the Bureau of Medicine and Surgery maintained that a distance of 5 feet between centers of cots or hammocks in barracks ashore represented a minimum standard for safety in this respect.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Proper housing conditions are not necessarily secured by the acceptance of standards relating to free air space, floor area, and separation between beds. Such minimum standards are of course very important, but even if they are followed in the construction of barracks, health and living conditions will not be satisfactory unless additional space is included for the men to move about in without encroaching upon the space actually occupied by cots and lockers. On board ship such space is available even with considerable overcrowding—passageways, offices, platforms in upper handling rooms, engine room, shops, etc., where the men may sit about in the evening if the weather on the upper deck is forbidding.

No standards will avail after the barracks are placed in service unless the permissible number of occupants is strictly limited to the number for which the building was planned and constructed. From the hygienic standpoint it would be highly desirable if the permissible number of occupants could be certified and marked in every sleeping compartment or room to be used as a dormitory, just as the spaces are certified in merchant ships.

It is a debatable question to what extent communicable diseases are spread under sleeping conditions. The requirement that there shall be 5 feet of separation between cots in barracks does not assume that it is of first importance to prevent transference of infection by means of the droplet spray while the men are occupying their cots. That is an important consideration in hospital wards, to be sure, and doubtless it is important in barracks too. But disease-producing microorganisms are exchanged among the personnel of a ship or station in a multitude of ways. Proper separation of cots is but one item in good sanitation.

The requirement that there shall be not less than 50 square feet of floor area per occupant in sleeping quarters is the paramount consideration. Not only does this requirement insure adequate provisions for ventilation—with proper construction—but it limits overcrowding under practically all existing conditions of indoor life at the station, assuming that adequate mess hall, drill hall, and work spaces are provided for the needs of the station.

Lofty ceilings are of no particular advantage to ventilation, and where they exist 12 feet is to be taken as the figure for practical purposes in computing the air space per capita. That assumes that greater height serves no useful purpose so far as ventilation is concerned.

In unceiled rooms in low buildings with peaked roofs the height is to be calculated as the distance from the floor to a point midway between the peak of the roof and the eaves. In such buildings overhead outlets are an advantage and almost a necessity. Patent ventilator cowls are not necessary, but protection against the beating in

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of rain is essential. Movable cowls that automatically revolve with change in the direction of the wind are sometimes advantageous in that the escape of heated air is somewhat quickened by aspiration when the outside temperature is high. The chief consideration is working area. The total outlet area should be 50 per cent greater than the combined working inlet area. Inlets should be numerous and small rather than few and large, especially in long dormitories. In other words, windows should be opened all along the room at regular intervals to the required extent; not one or two windows opened wide. There should be one working inlet space to not more than four occupants, and preferably fewer. With a cold strong wind blowing it may be desirable to open windows only on the lee side, but through and through ventilation is desirable when practicable. Ventilation depends also upon the adequacy of heating arrangements. Hot-water or steam radiation naturally should have sufficient radiating surface to maintain the room temperature at 68° F. and still permit the admission of enough fresh outside air in the coldest weather likely to be encountered to provide for at least six renewals per hour, and under all circumstances for enough fresh air to remove odors liberated from the bodies of occupants and from clothing stowed in the room. With adequate heating arrangements and the radiators hot, little is to be gained by opening the windows at night so wide that the room temperature falls below 55° F. If that is done some of the men will most likely be exposed to cold air blowing over the head of the bed and down under the bedding on to the chest.

To insure hygienic conditions, the ventilation of barracks must be supervised and regulated in accordance with changes in the weather. Proper instructions must be given and enforced. If left to the men the desires of those most capable of backing up their opinions with physical force are likely to prevail. With proper ventilation the air moves sectionally from numerous inlets toward the outlets so that the same air does not flow through the entire room.

Measures designed to check the spread of disease-producing microorganisms.—Overcrowding of the ship or station as a whole may be, and usually is, unavoidable so far as local authority is concerned. In practice it becomes necessary to make the best of existing conditions. Something can be done toward mitigating the dangers of overcrowding in overcrowded ships by distributing the crew to the best advantage. That means allowing men to sleep in spaces not primarily intended for berthing spaces, such as on platform decks in handling rooms, in well-ventilated offices, shops, and certain spaces in the engineering department. If the men are allowed to keep their

Digitized by Google Original from UNIVERSITY OF MICHIGAN

effects or some of their effects in such spaces they naturally form groups that are separated to a greater or less degree from the larger sections of the crew, and thus tend to prevent large groups from being still larger and still more closely housed. Other things being equal, all conditions make for safety that tend to divide the crew into small groups, such as the presence of separate gun rooms in which sections of the deck divisions are quartered instead of altogether in a single large compartment. The men quartered in a gun room have their effects there, take pride in the cleanliness and upkeep of the room, feel their responsibility for its condition more keenly, and perhaps have their own phonograph. They tend to stay in there to read or write, and altogether spend a considerable part of their leisure time in their own group. The same is true of office forces and men of certain other ratings if they are allowed to "hang out," as it is said, in their own part of the ship. Epidemiologically it is important that each of as many groups as possible have a part of the ship that can be called its own. It is unfortunate that toilet facilities, especially urinals for the crew, are not located at several different points in parts of the ship that serve as living quarters for the crew. Such provisions would do much to promote natural tendencies to form groups and lessen personal and crowd contact.

The lighting of heated spaces should receive attention. The object should be to provide adequate intensity and proper distribution of artificial light in comfortable places where small groups of men can read and write, play games, sew, or attend to other personal work. Properly illuminated areas for such purposes should be made available all through the crew's living spaces, not concentrated in the form of a reading room and a few other areas that tend to be overcrowded.

Casual and temporary overcrowding occurs particularly on the gun deck in the vicinity of the canteen, post office, barber shop, and sick bay. Men in line awaiting turn at sick call are likely to include a number acutely ill with tonsillitis, bronchitis, or other infections of the respiratory type. In other words, active carriers of virulent disease-producing microorganisms are likely to be concentrated at this point every morning and possibly at other times during the day. This should be recognized and steps should be taken to see that overcrowding in the vicinity of the sick bay at such times is not permitted. If the barbar shop, tailor shop, canteen, issue room, executive office, pay office, or some other office or shop, in front of which men must congregate, is located near by, arrangement should be made whereby overcrowding is prevented, either by a change in hours, or by forming the lines of waiting men in such directions as will prevent intermingling. Ample space and waiting facilities should be provided for the sick-call line. A suitable routine should

Digitized by Google Original from UNIVERSITY OF MICHIGAN

be adopted whereby men who are likely to infect others will be spotted promptly by the hospital corpsman handling the line so that they may be admitted without delay and the danger limited at once by confinement to bed and the prompt institution of bedside disinfection in cases where admission to the sick list is indicated.

Conditions on the gun deck with open hatches leading to the deck above are a mixture of outdoor and indoor conditions. Cold air in large volumes enters through various hatches, sometimes with considerable force. At the same time heated air is being delivered by blowers, or else there are hot radiators, and the air is also being warmed in the vicinity of bulkheads that surround heated spaces such as the upper spaces over engine rooms, firerooms, evaporator rooms, etc. This mixture of air states with respect to heating, ventilation, and hot and cold currents of air is of some epidemiological importance in the presence of overcrowding. Some of the men in line or otherwise congregated on this deck are at work and some are idle. Some have come from heated spaces below and are lightly clad; others have come from the upper decks and are wearing sweaters and perhaps overcoats.

A good deal can be accomplished toward preventing casual overcrowding under shut-in conditions both ashore and afloat by regulating work so that all men are kept busy and preferably employed as much as possible in the open air in such manner as will make for the least contact between groups and avoid loafing in crowded spaces on board ship or in buildings. Other things being equal, a busy crew will have less sickness from communicable respiratory diseases, least of all the crew of a ship of such type as to require a great deal of work on the upper deck or over the side in proportion to the size of the crew.

Ventilation and artificial heat should be regulated with special care to avoid overheating, blasts of cold air at high velocities, or subjection of the personnel in their work or leisure alternately to excessively heated air and cold outside air when dressed for indoor conditions, and especially when moist with perspiration from work. Care should also be taken to see that men are not billeted in the vicinity of blowers, where they must sleep in a current of hot dry air.

Sterilization of mess gear and all other practicable methods for limiting the indirect or direct transference of mouth and nose secretions naturally have their greatest value during the pneumonia, tonsillitis, and bronchitis season.

The use of wash buckets by two or more men in common for bathing their bodies, washing their clothes, and sometimes for scrubbing their teeth is a practice that should be stopped.

Finally, something can be accomplished by efforts to make the men themselves understand the methods by which these diseases are

Digitized by Google Original from UNIVERSITY OF MICHIGAN

spread or induced. The conditions should be explained in simple terms on the bulletin board. Incomplete or exaggerated statements do not carry far; plain facts couched in simple dignified language always receive attention and provoke discussion. A ship order calling attention to the methods by which disease-producing germs are disseminated and directing the crew to protect themselves from the infectious mouth and nose secretions of other men will carry some weight. For psychological reasons little or nothing can be accomplished by such dicta as urging men to cover the mouth and nose when coughing or sneezing. Man is not by instinct concerned with what happens to his neighbor except in so far as his neighbor's welfare concerns his own pleasure or profit. But tell him to guard himself against harm from the careless or insanitary habits of others and his interest may be aroused. The men should also be directed to protect themselves against chilling and to change promptly into dry clothing when wet.

Despite the lesser return to be expected from an appeal to protect the health of others, the convenient means afforded for carrying instruction out among the crew generally by men seen at sick call are not to be overlooked. A printed slip briefly informing him that he is temporarily a menace to others because of his infectious secretions and positively directing him to avoid contact and protect other men, may be handed to every man who receives treatment for a cold, sore throat, or cough. In that way the idea that such conditions are communicable and may in part be avoided by refraining from unnecessarily close contact, use of toilet articles in common, swapping cigarettes, etc., can be made gradually to permeate through the crew with very little effort by the medical department.

To a certain extent the control of communicable respiratory diseases is analogous to the control of yellow fever or any other insect-borne disease. It isn't necessary to kill every mosquito; indeed that is impossible, but comparatively little reduction in the numbers of the insects is accompanied by a definite reduction in the number of human cases. In a similar way, with the forces of immunization at work among the crew or population, the general but not to be measured reduction in contacts resulting from educational measures, supervision of personal hygiene, maintenance of good sanitation, early detection of infection, temporary or partial isolation with medical treatment, and concurrent disinfection can be expected to reduce the prevalence of respiratory diseases very decidedly below the incidence that would be experienced without the intelligent use of preventive measures. Reduction can be expected only in proportion to the painstaking application of all essential measures. Unfortunately, satisfactory standards for comparison do not exist.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

These diseases are universally prevalent in civil communities and the degree of exposure can not be measured with any exactness. Service factors such as overcrowding, rate of turnover among the crew, character of the routine, etc., are variable and can seldom be used in making comparisons for a given period of increased prevalence. It is particularly unfortunate that the very ship that tries the hardest to prevent disease fortuitously encounters conditions and circumstances that result in high admission rates. On the other hand, there are few organizations in which credit is more quickly given for good work and earnest efforts or given in greater measure than in the Navy.

MASS IMMUNITY TO DISEASES.

The editor of Health News, the monthly bulletin of the New York State Department of Health, makes the following comment on the subjoined article on "Some of the factors which lead to the increase and decline of communicable diseases among men and animals," by William H. Park, M. D., which appeared in the August issue of that useful periodical:

"With that simple clarity of expression which is one of his happiest gifts, Dr. William H. Park summarizes in this issue the recent researches which have advanced our understanding of the virulence of disease germs. Experiments on mice confirmed by observations of human cases indicate that carriers of diphtheria, for example, who get their germs from other carriers are less dangerous than carriers who become such by contact with diphtheria cases or who are themselves recovered cases. In other words, in measure as the germs radiate away from the original case and pass through other hosts without starting up new cases, they lose virulence, though fortunately still able to create some degree of immunity in the people in whom they lodge.

"The result of this process is that, in large cities particularly, a considerable number of people become immunized in varying degrees against certain infection. Doctor Park even found a certain paradoxical value in modern rapid-transit crowding, creating as it does a general meeting ground of germs and people, where a constant process of benign inoculation is going on, developing immunity indiscriminately in rich and poor, saving alike the believer and the unbeliever, the rationally minded and the antivaccinationist.

"There is a corollary, however, to this widespread process by which man slowly meets and overcomes his microscopic enemies. Animals carrying these mildly infectious germs ordinarily showed no signs of ill health, but they succumbed readily and in great numbers when subjected to insanitary conditions, improper food, and the like. No

Digitized by Google Original from UNIVERSITY OF MICHIGAN

less do human beings fall before ordinarily harmless attacks of infection when normal conditions of the environment give place to stress, strain, and resistance-lowering factors of war, famine, earthquakes, and similar emergencies. At the same time an epidemic brings rapidly increased virulence of the microbes as they pass directly from the many new cases to the many new victims.

"Referring again to the effect of overcrowding cars it is unfortunately true that the strap hanger becomes inoculated not only with germs which have lost their virulence but also with virulent ones which come from incipient or convalescent cases of infectious disease.

"Public health workers will find solid scientific comfort in Doctor Park's argument. Their work, he implies, is what keeps up normal resistance and suppresses the beginning outbreaks which so soon magnify the potency of disease germs and start the spreading vicious circles of an epidemic. Even such conservative critics as Raymond Pearl do not deny that the modern public health movement has won distinct triumphs. Doctor Park points out from a new angle the reason why civilized communities living normally under the modern public health régime exhibit such definite evidences of progress in the reduction of infectious diseases.

SOME OF THE FACTORS WHICH LEAD TO THE INCREASE AND DECLINE OF COMMUNICABLE DISEASES AMONG MEN AND ANIMALS.[1]

By W. H. Park, M. D., director of laboratories, New York City Department of Health.

We are all aware that during the past 50 years in New York State there has been a great and steady decrease in the number of advanced cases of tuberculosis and of severe cases of scarlet fever. In fact there has been a declining death rate in all the communicable diseases. Beyond the fact that we have discovered antitoxins, learned new diagnostic procedures, applied better forms of treatment, and safeguarded our water and food supplies, there is evidently some general underlying cause for this improvement. When a country is unsettled and health organization is disorganized and personal hygiene discarded, the results are the opposite. For instance, in Russia a very serious and very extensive epidemic of malaria has developed during the past five years. It is estimated that 9,000,000 cases have occurred and that there have been at least 2,000,000 deaths. Since 1918, there have been 30,000,000 cases of typhus and over 3,000,000 deaths. Tuberculosis, cholera, and other communicable diseases have to a somewhat less extent increased in severity and frequency.

[1] Reprinted from Health News, the monthly bulletin of the New York State Department of Health, August, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The decrease or increase in the severity and amount of communicable diseases is due to a number of causes, such as the virulence of the microorganisms, the resistence of the people, the number of susceptible individuals in a community, and the degree of protection of the host from contact with the microbes.

Before taking up the main topic I want to speak for a few moments on the virulence of microbes. I know that I have only lately come to realize how complex is this quality of virulence. Perhaps you who are health officers nad nurses have, like me, not fully realized how many forms of virulence there are.

The virulence which is indicated by the power to produce toxins allows of intoxication as in tetanus and diphtheria if the microbes are able to fasten on the tissues and increase. The virulence which allows a microbe to grow on the surface of the mucous membranes allows the development of carriers of certain organisms such as the pneumococcus and diphtheria bacillus. The virulence which allows of growth in the tissues permits infection in operative and accidental opening up of the body cavities and tissues to contamination. The virulence which permits the invasion through the intact coverings of the body permits the development of epidemics.

We now realize that when we speak of the quality of virulence in germs we must consider those which grow on the surface of the membranes, those which grow in the tissues, those which make toxins, and those which just being swallowed or inhaled cause disease.

Topley, of Manchester, who has done a great deal of work with animal plague, suggests that we give these different forms of virulence different names:

Supragliscence—the power of multiplication on the mucous membranes.

Intragliscence—the power to multiply in the tissues.

Perfringens—the power to break through the barrier opposed by the healthy epithelial surface.

Whether we use the words suggested by Topley to designate these different kinds of virulence is not of great importance, but the recognition of the fact that a microorganism may have one form of virulence without the others is of great value. To a certain extent diminshed virulence of a microbe can be replaced by an increase in quantity. Flexner and Amoss have developed this in their mice experiments. The severity of an outbreak of a communicable disease will be determined by the relative susceptibility of the individuals making up a population, the type of virulence and degree of virulence of the microbe, the degree of exposure and the health and living conditions of the people.

Some of the factors in the development of disease can be studied better in animals than in man. We can fix the conditions under

Digitized by Google Original from UNIVERSITY OF MICHIGAN

which a group of mice are exposed to infection so as best to serve our purpose. It would be most improbable that we would ever have the chance to study an outbreak of a communicable disease in such an exact way. For much of the experimental work done in mice a bacillus belonging to the paratyphoid group has been used.

Topley has reported some very interesting experiments on the conditions of the mouse population which allow an epidemic to develop and again on the conditions which cause germs from healthy carriers to lessen in virulence on passing to other carriers. For a general outbreak to occur the majority of the mice in a colony must be susceptible. If, either through survival from an outbreak or because of immunization, the number of susceptible individuals in a group is small, it is impossible, unless the bacteria have great invasive virulence, to develop an epidemic. If, however, an epidemic is started in a new group of mice and survivors of a previous outbreak are added, it is found that many of the latter will succumb. The rapid growth of the microbes in case after case in the epidemic has so increased the invasive power and the quantity of the microbes that the relative immunity of many of the survivors is insufficient to protect them. It has also been noted by many observers that under conditions of crowding, fatigue, insufficient food, improper food, lack of ventilation, etc., the relative immunity of the animals which would suffice to save them from microbes of a moderate invasive power is so lessened that infection and disease readily occur.

Before passing to human communicable diseases I want to touch on the gradual loss of virulence in pathogenic bacteria multiplying in carriers. Topley proved that, in mice at least, some microbes lose their power to spread disease by natural means when as surface growers in the carrier state they have passed through three successive animals. This experiment was carried out in the most painstaking manner. He took a group of mice suffering from an intestinal infection epidemic in nature. After the outbreak had passed a few mice survived and certain of these mice were known to be carriers. He took two of them and put them with five healthy mice. They were allowed to spend two days together so that the healthy mice would become infected from these two carrier mice (carriers after recovery from disease or from direct contact with diseased mice) and then he took these five fresh mice which were shown to have become infected and put them with a second lot of mice. This second lot of healthy mice were as before, simply in contact with the first lot for two days; then the second lot were taken out before the first lot developed disease and put with a third lot of healthy mice, and in two days the third lot of healthy mice were taken away and were put with a fourth lot of healthy mice. For 10 different tests he allowed just enough time to permit the ex-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

posure of fresh mice to the carriers before the latter developed disease. The interesting thing is that of the five mice that were in contact with those, three developed the disease and died; then of the third lot that were in contact with the second, two developed the disease. The fourth lot that had been put with the third lot remained well, although they became carriers. For the rest of the 10 lots the organisms in the carriers had so lost their invasive power that no longer were the healthy mice attacked. The important lesson is that cases of disease and direct contact carriers are more dangerous than carriers infected by carriers. The further the carrier is from a case of disease the less virulent the microbes. Even then if resistance is lowered disease may occur. All of us who use large numbers of laboratory animals know that especially in winter and early spring when animals have not been fed on fresh vegetables, shipping them on the railroads tends to bring out diseases which did not occur at the farms. This is because through loss of food on the way, overcrowding in the crates, and lack of ventilation the animals lose their natural resistance to carrier germs to which they did not succumb when in health, but with health lessened by exposure and fatigue the animals become diseased. The loss of virulence in carrier germs as they pass from mouse to mouse is also exemplified by diphtheria in man.

Some very interesting work by Doctor Frost has been going on in Baltimore and I have repeated it in New York City. One of the students working for a degree took this as a subject: "What danger is there from a diphtheria carrier of virulent diphtheria bacilli, who has not, so far as we know, had any contact with a diphtheria case?" This student has followed 20 families during the winter for from two to four and a half months, and in no instance in the 20 families with one or more carriers has diphtheria developed. The same thing is true in Baltimore. We all know that carriers, whether these be nurses or physicians or parents who developed as carriers from contact with a diphtheria case, do frequently transfer diphtheria; in the instances cited the carriers were without known contact with cases of diphtheria but in all probability had been carriers from carriers, etc., for a long time. They did not start disease in their families although a number of the members were Schick positives. This bears out the work on the mice that the germs from the carrier are less dangerous than those from the case itself and that the germs at each transfer are getting less and less virulent. There is a very hopeful side to this because undoubtedly to some degree, at least, these carrier microbes which, while still producing toxin, have lost much of their virulence are still able to immunize. The only reason we know of as to why children in the city have a higher per-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

centage of Schick negatives than children in the country is that in the city at any one time at least 1 per cent of the people are carriers of diphtheria bacilli and that probably these carriers are constantly changing; consequently although only few children develop diphtheria a great many become immune. When we ride in overcrowded cars, we doubtless breathe in germs from the respiratory tracts of our neighbors, yet only a few of us develop disease. Instead, many of us get a certain amount of immunity, for there is a tendency for some of the microbes to develop in the respiratory passages of those who have inhaled them and so become parasites and the hosts thus become carriers. If we do our utmost to keep the general health conditions as good as possible this carrier immunization tends to lessen disease. Under bad living conditions, just as the laboratory animals lose their resistance we lose ours and thus succumb to infection instead of developing a partial or complete immunity.

This is well illustrated in an epidemic of bubonic plague that developed in Manchuria 2 years ago. You probably remember that some 12 years ago there was a very virulent epidemic of pneumonic plague in China and a great many thousands of individuals died. After the epidemic the disease practically disappeared. A certain proportion of the rats in certain localities were still infected, but only once in a while a single case of plague developed. Then a new epidemic developed in 1920–21. A woman, presumably infected by a rat, developed the first case of plague. It was of the bubonic type, as the bacilli were not yet virulent enough to cause septicemia. Some of the Chinese in contact with her contracted the disease. Presumably this infection was caused by infected fleas from her. These cases were a little more virulent, because the bacilli were not from the rats but from a patient. The severity of the disease gradually increased as cases developed, so that in a month the cases were septicemic from the start; the bacilli now passed through the glands without stopping, and within 24 hours of the first symptoms many of the patients died. The virulence of the bacilli kept on increasing. In another month the cases were of the pneumonic type, and now patients infected others by direct passage. The dread of the disease became so terrific that the nation summoned its forces to try to stamp it out. From the first locality the plague passed out to other Manchurian towns. Among these was one where there were 6,000 workers engaged in a mine. Two thousand of the miners were Russians and lived in attractive little houses, well lighted and ventilated, and had good food. Four thousand were Chinese, and they lived under what to us were the most unhygienic conditions imaginable. In order to save heat in the winter the houses were built two-thirds underground and one-third above the surface. These barracks were,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

I think, 20 by 60 feet and 60 people occupied each. All the lighting was obtained through a few small skylights. Ventilation was through the door leading to the steps. In the barracks some 4 feet above the ground was a platform upon which these men ate and slept and lived. They were thus huddled together; they had no ventilation, but little light, and poor food. From the town in which the outbreak of bubonic plague already described had occurred some of the residents escaped to this town, and a number of cases suddenly broke out. The authorities made every effort to stop the outbreak, but 1,087 of the 4,000 Chinese died, while only 5 of the Russians died. The officials attempted to enforce the same health regulations in both populations, but how could you bring about suitable conditions when confronted with the ignorance and dirtiness of such people as in those crowded hovels. Sanitary conditions were readily enforced among the others. This example is very instructive as showing that under bad conditions an outbreak is inevitable, while under good conditions an outbreak is improbable.

In New York State we have a settled and intelligent population who submit to the measure put into effect by wise health authorities. What have been the results? We are conquering disease gradually and what we gain we hold. Think of tuberculosis. If you look back you will find that about 50 years ago the slightly upward trend of tuberculosis ceased and for 50 years in New York, Vermont, and Massachusetts there has been a slow and almost continuous improvement. That began before we had any actual knowledge of the tubercle bacillus; before we had pasturization ordinances, spitting ordinances, etc. I have no idea that if we dropped back to the early unhygienic conditions that tuberculosis would jump immediately to the height of 50 years ago. This drop of two-thirds in the mortality, and in the severe cases, is not only because of what we are doing in lessening the exposure and in improving the resistance of the population, but because there is a loss of virulence of the tuberculosis germ growing in our bodies and an increase in the average immunity.

Take another disease—scarlet fever. Probably even here many do not realize that in 50 years the annual mortality has dropped from 100 in each 100,000 population down to 4 in the city of New York, and probably to the same degree in the State. With better methods of treatment and a little better isolation the number of cases has only dropped one-third so that it is fair to assume that the scarlet fever virus has lost in virulence and the community has gained in resistance. So we have a lessening of the virulence of the scarlet fever virus and a slight increase in the resistance of the remaining population. This tremendous difference between scarlet fever now and scarlet fever 50 years ago must be due not to what we are doing today, but to the fact that the average virulence of the germs has les-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sened. Even in a disease where we have specific means of cure and prevention, such as diphtheria, there is no question but that the disease would be less severe even if we had done nothing in the way of immunization, because, even before we had discovered antitoxin, before the work of von Behring and others, the rate had already begun to drop.

I think many feel that deaths from pneumonia are as numerous as they were 30 or 40 years ago, but when we look at the statistics we find that pneumonia has lessened. We have now a yearly average of one-third less than we had 30 years ago, so it would seem that pneumonia germs must be lessened in virulence and that we have increased resistance through being immunized to a considerable degree by these carrier germs which are spread everywhere.

In such diseases as typhoid fever and malaria, to combat which we pasteurize the milk and sterilize the water and drain the land, we have removed the germs of disease to such an extent that we can not attribute the lessened mortality to lessened virulence in the germs or increased immunity in man. Curiously enough in typhoid fever I do not think there is any evidence that the typhoid germ in carriers has lessened in virulence, possibly because every typhoid carrier is really a convalescent typhoid patient in whom a chronic disease of the gall bladder has remained.

One disease is an apparent exception to all that I have been saying—influenza. You will notice that there has been an increase in the amount of influenza reported. I doubt very much if there has been a real increase. I have a very clear conviction that the term influenza as now used simply covers a respiratory infection accompanied by certain symptoms. The infection may be due to any one of several germs. It is a dignified thing to tell anyone that he has influenza—the physician and patient are both satisfied. Many diseases are called influenza now which would not have been called that several years ago. We all know that a great deal of investigation is being done on the etiology of influenza, and if we could find the germ that makes the pandemics we could then identify cases of true influenza. I wish that the brilliant work being done by Olitsky and Gates could be accepted as final, but they themselves do not claim absolute proof that *B. pneumosintes* is the germ. Olitsky has found a virus in a few cases, but there is no real proof yet that it is the cause of influenza, so, of course, we can not yet use it in diagnosis or to make vaccine.

Because of Doctor Nicoll's request I will, before closing, say a few words on the treatment and prevention of diphtheria and tetanus. When the characteristic symptoms of tetanus develop it is already a late stage of the disease, for by this time the poisons have been absorbed and the central nervous system has been at-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tacked; it is almost too late to do anything. Therefore we must see the importance of trying to prevent infection. Every health officer, nurse, and physician will realize that any penetrating wound should be thoroughly cleaned of all foreign material and laid open, under an anesthetic if necessary. If tetanus has developed, then we should treat the wound more actively, applying iodine, etc., to destroy the toxins that may be there. Treatment is what I wanted to speak about. If tetanus has developed, we need to get the antitoxin to the toxin at the very first moment and there should be no delay in a doubtful case to wait for the symptoms to become more clear. It is unfortunately true that some of the best surgeons wait 6, 8, or 12 hours to be sure of their diagnosis. This is almost criminal. Even if antitoxin be given at the first symptoms, it may be too late in an acute case. Should we give it intravenously or intraspinally? Some years ago when Doctor Nicoll and I were working together, we found that the intraspinal injection would save where the intravenous would not and the intravenous would save where the subcutaneous would not. The best treatment is to give the antitoxin both intravenously and intraspinally. The dose varies according to the size of the individual and the seriousness of the case. For a first intraspinal injection, 3,000 to 5,000 units in a child of 70 pounds and the same amount intravenously will suffice. Intraspinal doses should be repeated at the end of 12 and 24 hours and a subcutaneous dose on the third and sixth day to keep the supply of antitoxin in the blood at a high level. In an adult the amounts should be doubled. A total of 50,000 units should suffice for any case. Of course when we give a preventive dose we must remember that the antitoxin disappears in the course of 12 days to 3 weeks and, therefore, if we are going to do any further operating on the wound or if the wound remains open and possibly infected beyond 12 days, we must give another dose. When you give only one dose a good many patients develop late tetanus, but when you continue to give dose after dose as long as the wound remains possibly infected, you prevent the development of tetanus.

The same principles apply to diphtheria as to tetanus. In a light case of diphtheria you have simply a little local toxemia, but you have no constitutional poisoning by the toxin itself. Therefore, you can give antitoxin intramuscularly or subcutaneously, because within 20 minutes a small amount of antitoxin reaches the blood and all toxin later entering it will be neutralized. Although the patient will not get well as rapidly after a subcutaneus as after an intravenous injection, he will get well, and you haven't the annoyance of the chill which may follow the intravenous injection. The chill is very annoying, but probably it does no harm. In a bad case of diphtheria and in every case of tetanus I would omit the desensitizing dose. The need is so urgent that it is better to run the slight risk than to have

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the delay. We have lately been using intraperitoneal injections. These seem perfectly safe. Absorption from the peritoneum is about three times as rapid as from the muscle.

Just a word about toxin-antitoxin and the Schick test. In New York City, where we have been studying active immunization for the past nine years, we have pretty generally employed the Schick test before giving the toxin-antitoxin treatment, because in New York City the majority of the children are already immune. Then again, if you do not give the Schick test either before or after the injections, you never really know whether or not the child is immune. It may interest you all to know that, partly because of having tested some 500,000 children in New York City and injected the nonimmunes, and partly because we have issued to every school child a circular about diphtheria to take home to the family, diphtheria morbidity and mortality have been lessening with really striking rapidity. The deaths during the first six months of this year are 295 less than last year and 500 less than they were four years ago.

You probably would like to hear of the reason why we changed the formula of the toxin-antitoxin mixture that we were using in New York City. We first started using a preparation which had in each dose about 120 M. L. D. of toxin and to that we added 3 units of antitoxin. This we still belive to be a good mixture, and there is no reason to think that it has any less immunizing power than the new one. We found, however, that the reaction caused in some of the children was sufficient to prevent their taking the remaining injections and in a few instances was enough to keep them home for one of two days. These observations led us to try and lessen the reaction. We realize that we can immunize children with unaltered diphtheria toxin, but we have to give six or seven doses to get the same effect that we get with two or three of the toxin-antitoxin. By adding the antitoxin we nearly neutralize each molecule of toxin. This prevents the toxic action of the toxin on the tissue and we can give more toxin. We began with a very large amount of toxin (120 fatal doses) because we thought that with proper neutralization it would be a little better mixture than a small amount would make, but we have found on retesting that we could get just as good an immunizing result with this new mixture with only four fatal doses of toxin in an injection, so we prefer it because of the lessened protein contained. There is no radical difference between the two mixtures except there is a little more tendency on the part of the new one to deteriorate. This mixture, which is practical for distribution in New York City with a concentrated population, might not be so practical in the State. Properly made it is potent for about six months. The whole idea is to avoid the annoying protein reactions. If the new preparation is a little too toxic, it gives a reaction something like

Digitized by Google Original from UNIVERSITY OF MICHIGAN

unmodified toxin. This is absolutely unnecessary, for the mixture can be so adjusted that it will give the same immunizing results with much less annoyance than the old mixtures. We have given over 100,000 injections of the new preparation.

In closing I want to emphasize that the fact that the common communicable diseases and the microbes which cause them lessen in virulence in communities in which the people try to carry out the directions of capable public health authorities is very encouraging to us. For, even if we can not destroy the microbes or vaccinate the people, we can hope under favorable conditions to finally conquer the endemic communicable diseases. Only when the conditions of orderly life are changed as in war or revolution or famine do the microbes regain their virulence and human beings lose for the time part of their resistance. It is only then that many of the endemic diseases increase in virulence and number and tend to become epidemic.

HUMAN INTESTINAL PARASITES IN GUAM.

The following report was submitted July 3, 1923, to the governor of Guam by the health officer, Lieut. Commander Edwin U. Reed, Medical Corps, United States Navy:

In May, 1918, Dr. John B. Grant, of the International Health Board of the Rockefeller Foundation, conducted a survey of hookworm infestations in Guam, with the results and recommendations noted in the governor's annual report for 1918.

During the last three months the assistant health officer, Lieut. A. H. Dearing, Medical Corps, United States Navy, has conducted a survey of the human intestinal parasite infestations in the island, the results of which are given below. The survey has been in addition to other duties at the naval hospital and as sanitary officer and, owing to the limited time and personnel available for the work, the examinations have, as a rule, been limited to one slide from each specimen submitted, so the light hookworm infestations have often undoubtedly been reported as negative.

	Specimens examined.	Round.	Whip.	Hook.	Uninfested.
Navy and Marine personnel and their families:					
In Guam over 6 months—	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Adults	182	7.1	3.3	5.0	87.3
Children	29	68.9	31.0	20.6	24.1
In Guam less than 6 months—					
Adults	64	0	0	0	100.0
Children	6	0	0	0	100,0
Total	281	12.0	5.3	5.3	83.4

69626—23——10

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The much greater incidence among children is attributed to greater opportunities for contamination by polluted soil and closer contact with native servants; practically all of whom harbor intestinal parasites. Families and servants should go to the hospital or the sick bay at Sumay every six months or oftener, when indicated, for examination and for treatment when needed.

	Approximate population.	Specimens obtained.	Round.	Whip.	Hook.	Uninfested.
Native population:						
(*a*) Villages—			*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Agat	757	116	98.7	61.2	29.0	8.60
Asan	346	135	96.3	71.1	34.0	
Piti	581	169	97.6	79.8	36.0	
Dededo	175	92	100.0	66.3	32.3	
Sumay	665	61	88.5	68.8	14.7	6.30
Merizo	668	179	91.0	68.1	46.9	0.55
Jona	439	66	97.8	72.7	25.7	1.50
Inarajan	698	288	96.1	57.6	22.2	1.00
Umatac	346	109	88.0	66.8	49.5	
Total	4,725	1,215	93.8	67.0	31.2	1.5
(*b*) Agana districts—						
Santa Cruz		114	95.6	71.9	13.1	
Julale Bilibic		131	100.0	76.3	16.0	
San Ramon		116	93.9	85.3	25.0	
San Antonio		138	99.2	79.7	15.1	
San Nicolas		138	97.8	78.9	17.3	
Togao and San Ignacio		105	98.0	75.2	17.1	
Total	9,500	742	97.5	78.1	17.2	
(*c*) Total native population	14,175	1,957	95.2	71.2	25.9	0.90

Round and whip worm percentages were slightly higher in native children than in adults, while hookworm infestations ranged from 19.7 per cent for under 7 years to 27.9 per cent for over 30 years. Several round worms were recently found at autopsy in the intestines of a native boy 26 days old.

Very little variation as to incidence was found between the sexes.

In addition to the round worms (*Ascaris lumbricoides*), whip worms (*Trichuris trichiura*), and hookworms (*Necator americanus*), *Strongyloides stercoralis* embryos and *Oxyuris vermicularis* (pin worm) ova have been frequently observed. Two cases of amœbic dysentery have also been treated at the naval hospital during this period.

Soon after the American occupation of Porto Rico efforts were inaugurated to combat the ravages of the hookworm there. In 1904 an anemia commission was appointed, and from that time to 1920,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

$357,000 had been appropriated for the control of hookworm disease. In spite of the great amount of work that has been done, surveys show that this parasite is still widely spread and present in large numbers. A recent survey by Doctor Grant found the incidence to be from 90 to 100 per cent in a number of localities and records an average of 80.8 per cent for the entire island.

In Antigua, British West Indies, surveys and a treatment campaign have been conducted under the auspices of the International Health Board of the Rockefeller Foundation. During the original campaign of 1915–1917, 7,477 persons were examined in an area which has since been resurveyed. Of this number, 2,229 (29.8 per cent) were found infested with the hookworms. Of these, 1,972 were cured, so far as this could be determined, by giving thymol until no hookworm ova could be found in the stools. When the treatment campaign was practically finished, the authorities of Antigua built pit latrines throughout the area and appointed part-time sanitary inspectors to see that they were properly maintained. During the resurvey in 1922, 1,234 (62.6 per cent) of the 1,972 persons cured in 1915–1917 were reexamined for hookworm ova and 262 (21.2 per cent) were again found to be infested. A group of 300 persons who were free of hookworms in 1915–1917 were also examined and 16.3 per cent were found to be infested. In general, the persons who were treated and cured in 1915–1917 did not, in 1922, show a markedly decreased incidence of intestinal parasites other than hookworm, as compared with persons who were not treated in 1915–1917.

It should also be remembered that dogs, pigs, and perhaps other animals may also carry and disseminate intestinal parasites pathogenic for man.

By use of carbon tetrachloride it is believed that the number of persons infested, and especially the severity of the infestations, can be materially reduced; but in view of the above experiences and many others in this field of medicine, it is not believed that human infestations can be eradicated from Guam.

Fully as important as the use of carbon tetrachloride in this endeavor is the use of sanitary latrines and privies, and enforcement of Executive General Orders 194, 251, 261, and 298 is therefore necessary.

It is planned to spend two or three months in educational propaganda, thorough sanitary inspections, and in experimentation at the naval hospital with carbon tetrachloride and oil of chenopodium to determine which or what combination of the two will be most effective for mass treatments of the native population. It is believed

Digitized by Google Original from UNIVERSITY OF MICHIGAN

by the medical officers now here that much more disability in Guam is due to round worm than to hookworm infestations.

When a sufficient supply of carbon tetrachloride has been received, it is planned to give, under medical supervision, treatments to the inhabitants of one village or district at a time until all in the island have had an opportunity to take such treatments. In view of the facts that only relative results are expected and that the treatments are not entirely devoid of danger, it is not believed that the treatments should be made compulsory, but that all persons should be reached by the educational campaign and be advised and given opportunity to take the treatment. This campaign should be repeated yearly.

PREVENTION OF VENEREAL DISEASE IN ENGLAND.

In considering ways and means of attacking the venereal-disease problem in England it appears in the main that two contra-minded factions or opinionated groups recently came into existence. Heated controversy arose principally over the question of medical prophylaxis, or, as the English prefer to designate it, skilled or unskilled disinfection, according to whether disinfection is self-applied or administered by a trained person. Associated moral and ethical considerations in particular apparently furnished subject matter for acrimonious debate from which, according to the British Medical Journal, the great body of the medical profession held aloof.

Finally a committee of inquiry on venereal disease was appointed, with Lord Trevethin chairman.

The report of that committee has recently been published by the ministry of health. The World's Health, a monthly review published by the League of Red Cross Societies, summarized the report and commented editorially upon it in the August number, as follows:

"Readers of the International Journal of Public Health will remember the diverse points of view held by distinguished specialists in England on the subject of self-disinfection. This controversy may now be said to have been submitted to a judicial decision—the report recently made public by the ministry of health of the committee of inquiry on venereal disease.

"The committee point out that medical measures are not alone likely to be effective. The extension of knowledge as to the nature of venereal disease and its consequences is of the greatest importance. The following list of facts which should be made widely known are quoted from their report:

"'(*a*) That promiscuous intercourse is the main cause of the prevalence of venereal disease.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"'(*b*) That there is no absolute preventive except continence, and a single exposure may result in infection.

"'(*c*) That a large number of the sufferers from venereal disease are innocent persons, especially women and children.

"'(*d*) That syphilis is a disease of great gravity which, if not treated in its early stages, may have serious results, including affections of the circulatory system and of the nervous system, as, for example, general paralysis of the insane.

"'(*e*) That syphilis is transmissible by a mother to her children, and is a frequent cause of miscarriages, stillbirths, and death in early infancy, and in children who survive, of mutilating deformities, mental disease, and other defects.

"'(*f*) That gonorrhea is a more serious disease than is commonly believed, and, if not promptly treated, may have serious after consequences.

"'(*g*) That gonorrhea is a frequent cause of sterility and serious pelvic disease in women and a cause of blindness in children born of women suffering from gonorrhea.

"'(*h*) That the presence of these diseases in the community is a menace to the maintenance and advancement of the physical and intellectual standard of the race.'

"As regards strictly medical measures of prophylaxis they conclude that properly and promptly applied disinfection in the case of an individual man would almost certainly prove effectual, but that so far as the community at large is concerned, no sufficient case has been made to justify the introduction at the public expense of a general system of facilities either for self-disinfection or skilled disinfection, and wherever there is a limited amount of public money available, they have no doubt that money spent on (*a*) treatment of disease; (*b*) continuous education of the community in regard to the nature and dangers of venereal disease and the importance of seeking prompt and skilled treatment; and (*c*) the elimination of those conditions of life which tend to foster promiscuous intercourse and the spread of disease will be money better spent than any money expended on establishing a general system for affording facilities for disinfection."

The British Medical Journal, July 21, 1923, reports as quoted below, the action of the Society for the Prevention of Venereal Disease at its fourth annual meeting in adopting a resolution expressing agreement with and approval of the Trevethin report. The resolution is of interest in that it treats of the value of self-disinfection and records the favorable attitude of the society toward that preventive measure:

"Lord Willoughby De Broke, the president, gave an address pointing out that the Trevethin report amounted to a complete vindica-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tion and indorsement of the society's policy, and proposed the following resolution:

"'That the Society for the Prevention of Venereal Disease accept the Trevethin report as a document supporting the six essentials of the policy of the society, namely, that:

"'1. A man who after exposure is properly and thoroughly disinfected by disinfectants of appropriate nature and strength, runs little risk of infection.

"'2. An intelligent man, if furnished with reasonable instructions, can, in favorable conditions, effectively disinfect himself.

"'3. The adoption of skilled disinfection (in disinfecting centers) is not to be recommended as part of any general system, for reasons of time, cost, and impracticability.

"'4. The instruction by medical officers of venereal disease clinics of male persons attending such clinics, in the preventive use of disinfectants, offers a useful means of educating the community.

"'5. There is no evidence of facts in support of the view that any system of disinfection would tend to increase the number of exposures and raise the disease rate.

"'6. The law should be altered so as to permit properly qualified chemists to sell ad hoc disinfectants provided such disinfectants are sold in a form approved and with instructions for use approved by some competent authority.

"'And also in view of the unqualified acceptance of the Trevethin report by the National Council for Combating Venereal Diseases, that the Society for the Prevention of Venereal Disease is prepared to form a joint committee with the National Council for Combating Venereal Diseases under the chairmanship of Lord Dawson of Penn, to watch and further the policy based on the terms of the Trevethin report.'

"Dr. J. H. Sequeira, in seconding the resolution, said that as one who had served on the Trevethin committee he had been struck by the unanimity of the evidence in favor of immediate self-disinfection, which had greatly impressed the committee as a whole. Lady Askwith, chairman of the women's committee, in supporting the resolution said that she looked upon that day as the greatest in the society's existence, and considered that the Trevethin report offered great hopes that at last something would be done for the protection of the health of women and children. Mr. Basil Peto, M. P., urged that immediate steps be taken so as to insure that the necessary bill to amend the venereal diseases act, 1917, should be presented in the autumn session. Mr. Frank Souter said he had just returned from a visit to the Far East, where branches of the society had been established, with the result that venereal disease had been greatly reduced, to the immense benefit of local production and trade.

"The resolution was carried unanimously."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

HEALTH OF THE NAVY.

November morbidity reports reveal an 18 per cent increase in the incidence of the common respiratory diseases over the figures for October. Admission rates were 37.37 per 1,000 per annum for acute bronchitis and 37.98 for acute tonsilities. However, these figures are not especially high for the month of November. Certain other classes of disease which, according to the vital statistics of previous years do not vary in close correlation with the seasons, also increased during November. These were venereal diseases, diseases of the digestive system, and certain classes of noninfectious diseases.

Influenza admissions increased in number only by 15 per cent for the entire Navy. The admission rate was 15.05, as compared with 13.03 per 1,000 per annum, the five-year median rate for November.

Comparatively few cases of pneumonia occurred. Only 19 were reported, making the admission rate 1.9, which is 45 per cent less than the five-year median rate for November. Two of the cases occurred at naval training stations and two were reported from the United States Fleet. The remainder were scattered among all other forces.

Admissions for mumps also declined in numbers. The cases that were reported occurred mostly in the Battle Fleet and Scouting Fleet. No case occurred among forces ashore in the United States either in October or November. That is very unusual.

Scarlet fever has not been prevalent. Four sporadic cases occurred at the naval training station, Hampton Roads, Va., and two at the Great Lakes station.

Dengue continued more or less prevalent in Haiti and Santo Domingo. There were 62 cases among approximately 4,000 marines, as compared with 80 in October.

Admissions for malaria decreased somewhat in November. Fewer cases occurred throughout the summer and autumn this year than in any recent year. From the entire service there were reported 159 cases in August, 93 in September, 74 in October, and 63 in November.

The admission rate for venereal diseases, entire service, increased from 99.25 to 132.26 per 1,000 per annum. From the statistical evidence more effective employment of prophylaxis appears to be indicated.

Admissions for injuries also increased during November, making an admission rate of 76.77 per 1,000 per annum for injuries and poisoning, which is higher than the rate for several months. The three-year median rate for the corresponding month is 59.4.

The following table contains the rates per 1,000 per annum for the principal communicable diseases, November, 1923. For com-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

parison, corresponding median rates are given for the same month, years 1918 to 1922, inclusive:

	November, 1918–1922.	November, 1923.
Cerebrospinal fever	0.13	0
Diphtheria	.74	0.10
German measles	.42	.41
Influenza	13.03	15.48
Malaria	9.40	6.41
Measles	3.00	4.79
Mumps	13.52	11.51
Pneumonia	3.47	1.94
Scarlet fever	.47	1.83
Smallpox	0	0
Tuberculosis	3.74	2.14
Typhoid fever	.10	0

VITAL STATISTICS.

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those pubilshed in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$ or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

TABLE No. 1.—*Monthly report of morbidity in United States Navy and Marine Corps for the month of November, 1923.*

	Forces afloat.	Forces ashore.	Entire Navy.	Marine Corps.
Average strength	75,040	42,805	117,845	21,160
All causes:				
Number of admissions	2,640	2,824	5,464	1,087
Annual rate per 1,000	422.16	791.68	556.34	667.80
Disease only:				
Number of admissions	2,226	2,484	4,710	951
Annual rate per 1,000	355.96	696.36	479.57	584.24
Communicable diseases, exclusive of venereal disease:				
Number of admissions	288	262	550	142
Annual rate per 1,000	46.06	73.44	56.00	87.24
Venereal disease:				
Number of admissions	744	418	1,162	256
Annual rate per 1,000	118.97	117.18	118.31	157.27
Injuries and poisons:				
Number of admissions	414	340	754	136
Annual rate per 1,000	66.20	95.32	76.77	83.55

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 2.—*Number of admissions reported by Form F cards for certain diseases for the month of November, 1923.*

	Forces afloat, Navy and Marine Corps (strength, 75,040).		Forces ashore, Navy and Marine Corps (strength, 42,805).		Total (strength, 117,845).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases	2,226	355.96	2,484	696.36	4,710	479.57
Injuries and poisons	414	66.20	340	95.32	754	76.77
Total admissions	2,640	422.16	2,824	791.68	5,464	556.34
Class III:						
Appendicitis, acute	26	4.16	42	11.77	68	6.92
Autointoxication, intestinal	12	1.92	11	3.08	23	2.34
Cholangitis, acute	14	2.24	10	2.80	24	2.44
Cholecystitis, acute	3	.48	3	.84	6	.61
Colitis, acute	4	.64	1	.28	5	.51
Constipation	17	2.72	17	4.77	34	3.46
Enteritis, acute	8	1.28	51	14.30	59	6.01
Gastritis, acute catarrhal	3	.48	10	2.80	13	1.32
Gastroenteritis	29	4.64	37	10.37	66	6.72
Hemorrhoids	18	2.88	24	6.73	42	4.28
Pharyngitis, acute	7	1.12	37	10.37	44	4.48
Ulcer of duodenum	1	.16	2	.56	3	.31
Ulcer of mouth	1	.16	0	.00	1	.10
Ulcer of stomach	0	.00	2	.56	2	.20
Total	143	22.87	247	69.24	390	39.71
Class VII:						
Varicocele	9	1.44	7	1.96	16	1.63
Class VIII:						
Chickenpox	5	.80	2	.56	7	.71
Diphtheria	0	.00	1	.28	1	.10
German measles	3	.48	1	.28	4	.41
Influenza	108	17.27	44	12.33	152	15.48
Measles	8	1.28	39	10.93	47	4.79
Mumps	105	16.79	8	2.24	113	11.51
Pneumonia, broncho	2	.32	2	.56	4	.41
Pneumonia, lobar	6	.96	9	2.52	15	1.53
Scarlet fever	1	.16	17	4.77	18	1.83
Total	238	38.06	123	34.48	361	36.76
Class IX:						
Dysentery, bacillary	0	.00	5	1.40	5	.51
Dysentery, entamebic	4	.64	2	.56	6	.61
Typhoid fever	0	.00	1	.28	1	.10
Total	4	.64	8	2.24	12	1.22
Class X:						
Dengue	31	4.96	62	17.38	93	9.47
Malaria	8	1.28	55	15.42	63	6.41
Total	39	6.24	117	32.80	156	15.88
Class XI:						
Tuberculosis (all forms)	7	1.12	14	3.92	21	2.14
Class XII:						
Chancroid	182	29.10	111	31.12	293	29.83
Gonococcus infection	491	78.52	249	69.80	740	75.35
Syphilis	71	11.35	58	16.26	129	13.13
Total	744	118.97	418	117.18	1,162	118.31
Class XVIII:						
Bronchitis, acute	142	22.71	225	63.08	367	37.37
Laryngitis, acute	6	.96	10	2.80	16	1.63
Pleurisy, acute fibrinous	9	1.44	4	1.12	13	1.32
Rhinitis, acute	12	1.92	8	2.24	20	2.04
Tonsillitis, acute follicular	198	31.66	175	49.06	373	37.98
Total	367	58.69	422	118.30	789	80.34
Class XX:						
Hernia	21	3.36	22	6.17	43	4.38

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal disease reported from ships for October and from various shore stations for the four-week period November 4 to December 1, 1923.*

	Annual rate per 1,000, October.			Average rate since July 1, 1923.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All ships	0	135.18	875.54	0	147.36	585.37
Battleship divisions:						
Battle Fleet	38.68	95.59	312.85	74.40	109.76	181.86
Scouting Fleet	9.27	97.71	204.78	101.35	147.17	205.29
Asiatic Fleet	(1)					
Destroyer squadrons:						
Battle Fleet	0	54.31	244.90	0	75.38	278.35
Scouting Fleet	0	274.18	875.54	0	202.73	557.23
Asiatic Fleet	(1)					
Miscellaneous: [2]						
Battle Fleet	0	72.70	500.00	0	104.07	287.42
Scouting Fleet	0	115.08	526.31	0	125.28	395.60
Asiatic Fleet	(1)					
Naval forces, Europe	0	229.40	505.26	0	213.31	356.43
Special service squadron, based on Panama	169.01	319.10	606.06	67.23	221.36	306.41
Naval transportation service	0	173.24	537.31	98.36	164.89	318.25
Special duty	0	344.05	853.08	0	127.21	585.37
Miscellaneous and district vessels	0	298.96	554.62	0	238.61	571.75
	Annual rate per 1,000, Nov. 4 to Dec. 1, 1923.			Average rate since July 1, 1923.		
All naval districts in the United States	0	61.10	393.94	0	65.89	220.94
First naval district	0	36.84	393.94	28.08	52.96	210.39
Third naval district	0	49.79	132.27	13.85	71.63	115.38
Fourth naval district	21.45	76.58	121.01	22.27	101.99	59.39
Fifth naval district	0	53.17	66.70	0	62.61	78.53
Sixth naval district	35.43	46.33	163.87	43.03	56.17	220.94
Seventh naval district	0	0	0	0	0	0
Eighth naval district	0	58.69	67.97	46.38	48.13	56.67
Ninth naval district	92.62	92.62	92.62	101.11	101.11	101.11
Eleventh naval district	23.81	48.22	58.82	22.52	35.47	68.29
Twelfth naval district	72.36	133.51	218.91	39.32	92.92	173.01
Thirteenth naval district	83.33	92.36	102.36	48.12	91.83	156.01

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal disease reported from ships for October and from various shore stations for the four-week period November 4 to December 1, 1923*—Continued.

RATIO OF GONOCOCCUS AND SYPHILIS INFECTIONS TO TOTAL CASES OF VENEREAL DISEASE.

	Per cent, October.		Per cent since July 1, 1923.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All ships	68.61	8.09	69.20	8.26
Battleship divisions:				
Battle Fleet	82.54	11.11	86.85	8.48
Scouting Fleet	77.97	8.47	71.43	6.70
Asiatic Fleet	(1)			
Destroyer squadrons:				
Battle Fleet	84.00	8.00	90.44	5.15
Scouting Fleet	71.28	2.13	64.03	5.03
Asiatic Fleet	(1)			
Miscellaneous: [2]				
Battle Fleet	83.87	9.68	88.03	5.63
Scouting Fleet	54.54	14.54	63.72	14.42
Asiatic Fleet	(1)			
Naval forces, Europe	48.27	8.62	61.06	6.64
Special service squadron, based on Panama	45.45	15.15	53.00	6.00
Naval transportation	55.00	5.00	63.25	5.12
Special duty	70.73	0	68.13	5.49
Miscellaneous and district vessels	69.44	8.33	63.72	8.85
	Per cent Nov. 4, to Dec. 1, 1923.		Per cent since July 1, 1923.	
All naval districts in the United States	81.08	9.46	79.01	9.57
First naval district	83.34	8.33	81.82	15.15
Third naval district	88.89	0	73.13	11.94
Fourth naval district	50.00	12.50	74.58	10.17
Fifth naval district	76.09	10.86	74.22	10.55
Sixth naval district	70.00	10.00	70.91	7.27
Seventh naval district	0	0	0	0
Eighth naval district	100.00	0	85.00	0
Ninth naval district	92.86	7.14	85.39	7.87
Eleventh naval district	92.31	7.69	85.11	8.51
Twelfth naval district	78.95	21.05	84.51	7.04
Thirteenth naval district	100.00	0	97.50	2.50

[1] Report contained in Monthly Health Index for Jan. 15, 1924.
[2] Vessels of train, base, air squadrons, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 4.—*Summary of admissions reported by Form F cards and annual rates per 1,000, entire Navy, for the four-week period November 4 to December 1, 1923, inclusive.*

	Navy (strength, 96,685).		Marine Corps (strength, 21,160).		Total (strength, 117,845).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases of blood	0	0	0	0	0	0
Diseases of circulatory system	21	2.82	8	4.91	29	3.20
Diseases of digestive system	438	58.89	165	101.37	603	66.52
Diseases of ductless glands and spleen	1	.13	1	.61	2	.22
Diseases of ear	61	8.20	19	11.67	80	8.82
Diseases of eye and adnexa	60	8.07	11	6.76	71	7.83
Diseases of genito-urinary system (non-venereal)	90	12.10	19	11.67	109	12.02
Communicable diseases transmissible by oral and nasal discharges	295	39.66	50	30.72	345	38.06
Communicable diseases transmissible by intestinal discharges	6	.81	7	4.30	13	1.43
Communicable diseases transmissible by insects and other arthropods	61	8.20	82	50.38	143	15.77
Tuberculosis (all forms)	16	2.15	3	1.84	19	2.10
Venereal diseases	943	126.79	256	157.27	1,199	132.26
Other diseases of infective type	219	29.44	60	36.86	279	30.78
Diseases of lymphatic system	39	5.24	19	11.67	58	6.40
Diseases of mind	20	2.69	9	5.53	29	3.20
Diseases of motor system	56	7.53	15	9.23	71	7.83
Diseases of nervous system	26	3.50	7	4.30	33	3.64
Diseases of respiratory system	797	107.16	151	92.77	948	104.57
Diseases of skin, hair, and nails	75	10.08	26	15.97	101	11.14
Hernia	30	4.03	7	4.30	37	4.08
Miscellaneous diseases and conditions	247	33.21	23	14.13	270	29.78
Parasites (fungi and certain animal parasites)	109	14.66	13	7.99	122	13.46
Tumors	11	1.48	0	0.00	11	1.21
Injuries	554	74.49	120	73.72	674	74.35
Poisons	16	2.15	16	9.83	32	3.53
Total	4,191	563.48	1,087	667.80	5,278	582.22

TABLE No. 5.—*Deaths reported, entire Navy, for the four-week period November 4 to December 1, 1923, inclusive.*

Cause.	Navy (strength 96,685).	Marine Corps (strength, 21,160).	Total (strength, 117,845).
Influenza	1		1
Pneumonia:		0	
Broncho	1	0	1
Lobar	1	0	1
Tuberculosis, chronic pulmonary	2	0	2
Malignant growths	2	0	2
Other diseases	4	0	4
Drowning	11	0	11
Other accidents and injuries	6	1	7
Poisons	3	0	3
Total	31	1	32
Annual death rate per 1,000, all causes	4.17	.61	3.53
Annual death rate per 1,000, disease only	1.48	0	1.21

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 18 1924

VOL. XX NO. 2

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

FEBRUARY, 1924

(MONTHLY)

Compiled and published under authority of Naval Appropriation Act for 1924
approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

TABLE OF CONTENTS.

Surgeon General's Library, U. S. Navy

	Page.
PREFACE	V
NOTICE TO SERVICE CONTRIBUTORS	VI
SPECIAL ARTICLES:	
Detection of the Psychopath and Classification of Naval Recruits in Accordance with Their Intelligence. By Lieut. A. W. Stearns, Medical Corps, United States Navy	149
Insulin Treatment of Diabetes Mellitus. By Lieut. Commander W. D. Owens, Medical Corps, United States Navy	170
Novocaine Anesthesia. By Lieut. Commander G. F. Cottle, Medical Corps, United States Navy	184
Observations Concerning Yaws in Haiti. By Lieut. P. W. Wilson, Medical Corps, United States Navy	190
Relation of the Clinical Laboratory to the Modern Hospital. By Lieut. H. S. Sumerlin, Medical Corps, United States Navy	196
Gas Mask for Head and Chest Injury Cases. By Lieut. F. F. Lane, Medical Corps, United States Navy	200
CLINICAL NOTES:	
Improved Technic in Spinal Puncture. By Lieut. Commander T. W. Raison, Medical Corps, United States Navy	205
Traumatic Hematoma of Spermatic Cord. By Lieut. L. H. Williams, Medical Corps, United States Navy	206
Cystoscopy and Report of Three Unusual Cases. By Lieut. L. B. Marshall, Medical Corps, United States Navy	207
NOTES AND COMMENTS:	
Value of psychometric tests in the Navy—Need of physiotherapy—Two physicians of Tortola—The all-purpose canister gas mask—Etiology of gout—Bulletin of the National Board of Medical Examiners—Practical objectives in health work—Alcohol taxation and alcoholism in Denmark—Revision of the pharmacopœia—Phlebotomy in the monasteries—New method of treating syphilis—Operating-room lighting	213
NURSE CORPS:	
Nursing in the Philippine Islands—Cooperation with all departments	231
BOOK NOTICES	235
PREVENTIVE MEDICINE, STATISTICS:	
Eradication of Vermin on Board Ship	247
Supplementary Report: Review of Literature Relating to Prophylaxis of Measles. By Dr. T. W. Kemmerer, United States Public Health Service	268
Swimming Pools in Detroit—Epidemiological Considerations	271
Adoption of New Housing Ordinance by the City of San Diego, Calif	274
Medical Department Activities at Naval Training Stations	275

TABLE OF CONTENTS.

Page.

PREFACE V

NOTICE TO SERVICE CONTRIBUTORS VII

SPECIAL ARTICLES.

Directions of the Personnel and Classification of Naval Reserves.

Course in Accordance with These Instructions.

By Lieut. A. W. Stearns, Medical Corps, United States Navy.... 149

Specific Therapeutics of Diuretics Medicines.

By Lieut. Commander W. D. Owens, Medical Corps, United States Navy.... 170

Observations Concerning Yaws in Haiti.

By Lieut. Commander G. E. Cleeve, Medical Corps, United States Navy.... 184

Observations Concerning Yaws in Haiti.

By Lieut. P. W. Wilson, Medical Corps, United States Navy.... 190

Duration of the Curative Laboratory to the Mumps Hospital.

By Lieut. H. E. Smallin, Medical Corps, United States Navy.... 199

Clay Slabs for Bread and Cheese Lumpy Class.

By Lieut. F. F. Low, Medical Corps, United States Navy.... 200

TECHNICAL NOTES.

Improved Technic of Spinal Puncture.

By Lieut. Commander I. W. Hanson, Medical Corps, United States Navy.... 205

Tuberculous Hyperemia of Testicular Cords.

By Lieut. L. H. Wilkins, Medical Corps, United States Navy.... 208

Cystoscopy and Ureteral Catheterization.

By Lieut. L. E. Marshall, Medical Corps, United States Navy.... 207

NOTES AND COMMENTS.

Value of psychometric tests in the Navy—Need of physiotherapy—

Two physicians of Washington in the Medical Board of Medical Examiners—

Etiology of [illegible]—Personal observations in [illegible] Medical Examiners—

[illegible] in the Philippine Islands—Cooperation with all departments—

[illegible] in the Philippines—New method of treating syphilis—Cure—

[illegible] Reform.... 213

CURRENT COMMENTS.

Medical [illegible] Philippine Islands—Cooperation with all departments.... 231

[illegible] in the Philippines.... 232

BOOK NOTICES.... 235

PROGRESSIVE MEDICINE STATISTICS.... 247

Examinations of Urine on Board Ship.

Supplementary Report: Review of Literature Relating to

Prophylaxis of Measles.

By Dr. T. W. Kennedy, United States Public Health Service.... 258

Smallpox Foods in Detroit—Experimental Observations.... 271

Abortions of New Horizon Observance by the City of San Diego.... 274

Cure.... 276

Medical Department Activities at Naval Training Stations....

PREFACE.

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles, but still more so in reviews.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

Only the names of actual reviewers for a current number appear.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX. FEBRUARY, 1924. No. 2.

SPECIAL ARTICLES.

THE DETECTION OF THE PSYCHOPATH AND THE CLASSIFICATION OF NAVAL RECRUITS IN ACCORDANCE WITH THEIR INTELLIGENCE.

By A. W. STEARNS, Lieutenant, Medical Corps, United States Naval Reserve Force.

The writer of this paper has been asked frequently to describe certain methods, developed by him during the late war, for the detection of the psychopath and the classification of naval recruits in accordance with their intelligence. These inquiries have come from naval medical officers and from physicians interested in industrial establishments; therefore it has seemed wise to prepare a short description of these methods and to discuss their advantages to the naval service.

During the war large numbers of young men representing all degrees of ability, education, and training entered the Navy. The number who sought service was so large that no method of estimating the worth of the individual seemed possible, yet it was highly desirable that some sort of classification be made in order that each man might as far as possible be used to the best advantage by the Government. The first rough grouping was made at the recruiting offices, but there the work had to be done quickly and imperfectly, and so an accurate classification at the training stations became important.

The writer was detailed at one of the large naval training stations as psychiatrist for the purpose of detecting those recruits who by reason of mental defect or instability were not qualified for the naval service. In order to detect defectives, a brief life history of each recruit was obtained upon his arrival at the station and recorded on a card which will be described later. These history cards were filed, the careers of doubtful individuals followed, and special study was made of those who failed to adjust themselves to naval life. A small percentage of mentally unfit was found. In general, lack of success by psychopathic individuals seems to be due to one of three factors: (1) Inability to learn, (2) disciplinary troubles, (3) sickness.

In the course of this history taking a mass of information was accumulated concerning the entire personnel. Gradually, and at first informally, different departments began to make use of this information. The public-works officer, always on the lookout for artisans, began to consult the history files. The executive officer, seeking college men as possible material for the commissioned officers' school, found the same cards useful, and instructors in the various

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

schools frequently referred to them in connection with their problems. This demand grew to such an extent that it seemed advisable to devise a scheme by which the whole mass of military raw material might be classified and indexed. In starting such a classification, it was somewhat difficult to know where to begin and where to stop. The first question to be answered was, What facts concerning a man are of fundamental importance to the Navy? With simplicity as well as utility in mind four things were chosen as of primary importance.

First. *Physical condition, including health in general.*—This needs no discussion here, as the Bureau of Navigation does not recognize graded service and so it is presumed that every man accepted is physically fit for general service; those not so found are supposedly eliminated as soon as detected. From the experience of several thousand physical examinations it appeared to the writer that some improvement could be made in this field if a history were taken and if more emphasis were placed upon function and less upon anatomical findings.

Second. *Mental condition, including capacity as well as health.*—Here, again, all accepted were supposed to be free from mental disease or defect. This, however, was not the fact. Some examining physicians advocated accepting feeble-minded and psychoneurotic patients; others made no attempt to detect them. Any one advocating the use of mentally handicapped patients for military purposes can not be familiar with such cases and from the writer's experience every attempt should be made to exclude them. Therefore the first step aiming toward classification must be the detection of the mentally unfit. Having eliminated the unfit, those accepted would range in mental capacity from dull, through normal to the most brilliant. The Navy in time of war can use men of all degrees of intelligence above the feeble-minded, but it is obviously wise to use them for different work. Rather dull men can be used for general detail and in the fireroom. Brighter ones are needed to enter the various schools and the brightest would naturally be officer material.

If time enough were available, each man would probably find his level, but the "trial and failure" method is neither efficient nor economical, providing some other can be devised. Recommendations of company commanders vary in reliability as they are dependent upon a fallible personal opinion and oftentimes upon meager information. Educational qualifications are not enough. It is probable that psychological tests, imperfect though they may be, offer the best method of forming a general estimate of a man's capacity.

Third. *Formal education.*—Though the amount of formal education received is not a fair index of a man's possibilities, it does help toward forming an estimate of his worth. College men have had

Digitized by Google Original from UNIVERSITY OF MICHIGAN

certain special studies making them more available for intensive training as officers and, though no illiterates are received in the Navy, those with a meagre education are hardly able to do the work required by the schools.

Fourth. *Industrial training.*—The rapidity with which the Navy expanded during the war made it essential that any special skill acquired prior to enlistment be known and utilized. If all recruits entering the service were classified in accordance with their ability, men possessing special skill could be located easily. It is of great value in estimating a man's capacity to know the degree of his industrial success.

These four things, then, seemed of enough importance to warrant their accurate determination in the case of each recruit. Each ship or station by having men so classified could use its man power to better advantage. Properly indexed, this information would become readily accessible, and when a man's subsequent record is at hand it may truly be said that a beginning has been made in the "measure of a man."

THE DETECTION OF THE UNFIT.

The function of a physician in a military establishment is somewhat different from that in civil life. In the latter we are accustomed to think of his work as humanitarian, while in the former the first reason for his presence is to help maintain the efficiency of a fighting machine, and the results of his humanitarian efforts, however great they may be, are a by-product of his total activity. Fortunately these two functions usually coincide. Roughly speaking, his work may be divided into three phases which interlace but are somewhat distinct:

(1) Selection and preparation of recruits.
(2) Maintenance of health of personnel.
(3) Repair of casualties incident to service.

Obviously, barring contagious diseases and wounds, the extent of the second problem is dependent on the thoroughness of the first and that of the third upon the second, and so when a recruit is selected the law of probabilities is used; that is, the problem involves the determination of which persons, if accepted, will be most likely to be healthy and fit when actually needed for military operations. In civil life an individual with a handicap can regulate his work to counterbalance the ill effect of such a handicap; in military service this is not possible, so the question to settle is, Which individual will be most likely to be continuously fit so that he may be available at any moment when required? This is quite a complicated problem compared, for instance, with examination for life insurance, which has to consider length of life alone. In the naval service not only the likelihood of disability and the degree of such disability, but the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

amount of effort necessary to care for the individual while disabled and the chance of his restoration to duty must be considered. I think it can be shown that nervous or mental disease in an individual is more apt to result in disability, that the disability is greater and presents more difficulty in care with less chance of cure than almost any other class of disease. Furthermore, in many cases these conditions are due to a congenital, incurable defect. In others when a cure is brought about, a recurrence is to be expected. It is not possible to show the full extent of the psychiatric problem in the naval service by statistics, because the most numerous class of cases does not come to the attention of the medical department, but remains at present a problem of training and discipline. This, of course, is the feeble-minded group. Many studies, both in and out of the naval service, have shown the sameness of individuals who are classed as inapt, undesirable, intractable, incorrigible and defective.

Again, the next group in size and importance, and in case of large military operations, if one may judge from the figures of European armies, perhaps the largest and most important group is the psychoneurotic group. Statistics also fail to show the importance of this group in the service for two reasons: First, they are often ambulatory patients and so not recorded; and, next, when admitted they are often classified under some prominent symptom, such as headache, tachycardia, insomnia, etc. Nevertheless, statistics show the problem to be a large and constant one.

The relative damage by different groups is shown by the following table, being an average of a four-year period, 1913, 1914, 1915, and 1916, as taken from the reports of the Surgeon General:

TABLE 1.—*Four-year average: 1913, 1914, 1915, 1916.*

Class.	Division.	Damage.
8	Infective type (nonvenereal)	606.72
8	Infective type (venereal)	479.14
20	Wounds and other injuries	322.35
3	Digestive system	258.62
14	Respiratory system	156.87
12	Motor system	151.75
11	Mind	115.45
7	Genito-urinary system (nonvenereal)	112.64
13	Nervous system	111.34
5	Ear	89.99
2	Circulatory system	87.98
6	Eye and adnexa	76.91
17	Miscellaneous diseases and conditions	74.53
16	Herniæ	58.83
15	Skin, hair, and nails	39.59
18	Parasites	31.59
10	Lymphatic system	29.22
21	Poisons	19.11
19	Tumors	13.13
4	Ductless glands and spleen	9.76
1	Blood	2.92

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE 2.

Cases:		
Total for the year--45,516.	Total damage--	2,955.50 men, or 6 per cent.
Infectious diseases (nonvenereal)----------11,106.	Damage-------	722.43 men, or 6 per cent.
Infectious diseases (venereal) ----------10,261.	Damage-------	546.95 men, or 5 per cent.
Diseases of the mind --235.	Damage-------	119.62 men, or 50 per cent.
Diseases of the nervous system----------427.	Damage-------	92.33 men, or 21 per cent.
Nervous and mental diseases----------662.	----------	221.95 men, or 32 per cent.

This relatively large damage is due to the large percentage of nervous and mental cases which were invalided from service.

TABLE 3.—*Cases invalided from the service during the fiscal year 1918.*

	Number invalided.	Per cent.
445,516 cases----------	1,156	2
662 nervous and mental cases----------	200	33

This shows that a person with a tendency to nervous or mental disease is 16 times more likely to be invalided from the service than a man having disease in general. These figures do not include several rather large groups of nervous diseases, such as neurosis of the bladder, intestinal neurosis, etc., which are classified in other groups. Neither do they include the tremendous damage from feeble-minded and subnormal individuals discharged for disciplinary reasons. This loss can not be definitely shown, but can be estimated from the report of the Judge Advocate General of 1916.

TABLE 4.

Discharged as undesirable for inaptitude or with ordinary discharge, not recommended for reenlistment----------	1,000
Discharged with dishonorable discharge----------	2,296
Total desertion for the year----------	1,681
Total prematurely lost to service, or 7.88 per cent of the total number of men handled for the year----------	5,733

Major Edgar King[1] has estimated that mental disease causes 39.9 per cent of discharges for delinquency for the Army.

One certainly takes no risk in assuming that mental disease, especially defect, is a large factor in military delinquency.

The case against nervous and mental disease is a strong one, and there is abundant evidence to show that when present it usually exists prior to enlistment or appears soon afterward. Its greater frequency in recruits would indicate this. In King's analysis it is

[1] King, Edgar. The military delinquent. Quoted in Mental Hygiene, July, 1917.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

stated that 90 per cent existed prior to enlistment. All of the congenital conditions, of course, exist at time of enlistment. Becker's [2] figures showing the frequency of occurrence of mental disease in the German Army illustrate this fact.

TABLE 5.

	Per cent.
Cases occurring in the first 3 months of service	37.8
Cases occurring in the second 3 months of service	28.2
Cases occurring in the third 3 months of service	21.6
Cases occurring in the fourth 3 months of service	12.4

In a series of cases invalided from service during 1917 collected by the author,[3] 34 out of 35 existed prior to enlistment. Also a series of 2,000 consecutive arrivals examined at a training station showed the following conditions:

TABLE 6.

Diagnosis.	Number.	Per cent.
Feeble-minded	40	2.00
Psychoneurosis	17	.85
Psychosis	2	.10
Epilepsy	4	.20
Stammering	5	.25
	2	.10
Chronic alcoholic	2	.10
Psychopathic personality	2	.10
Defective delinquent	3	.15
	4	.20
Total	81	4.00

The medical causes for the rejection of recruits for the year 1916 were as follows:

TABLE 7.

Errors of refraction	5,360
Underweight	4,507
Defective teeth	3,935
Flat or weak feet	3,534
Deformities	2,822
Varicose veins for varicocele	2,331
Under height	1,623
Heart affections	1,439
Color perception defective	1,352
Genito-urinary (venereal)	914
Tuberculous or suspects	657
Mental disorder	*231*
Nervous condition	*45*

[2] Becker, Theophil. Der angeborene Schwachsinn in seinen beziehungen zum Militardienst. Berlin, 1910. Quoted in Mental Hygiene, October, 1917.

[3] Stearns, A. W. The psychiatric examination of recruits. Jour. Am. Med. Assn., Jan. 26, 1918.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

If the writer's percentages hold in the case of the 14,727 men enlisted in 1916, and there is every reason to suppose that they do, 588 of them had nervous or mental diseases, 294 were feeble-minded, and 130 were psychoneurotic.

Some reference should be made to the lessons learned through the European war. This can best be done by quoting from the admirable report of Maj. Thomas W. Salmon, M. R. C.[4]

> No medico-military problems of the war are more striking than those growing out of the extraordinary incidence of mental and functional nervous disease (shell shock). Together, these disorders are responsible for not less than one-seventh of all discharges for disability from the British Army, or one-third, if discharges from wounds were excluded. * * * By their very nature, moreover, these diseases endanger the morale and discipline of troops in a special way and require attention for purely military reasons.

The proper attitude toward most cases of nervous and mental diseases can be summed up in two dicta: (1) Prevent enlistment, if possible; (2) dismiss from service as soon as detected.

In considering the general medical problem of recruiting, three facts must be studied:

(1) The source and quality of material available.
(2) Present methods and equipment for selecting material desired.
(3) Undesirable types usually not detected.

This problem is quite analogous to the employment of help in civil life, except that the relative importance of certain factors making for desirability is reversed. If a man wishes a job with a large corporation, three factors are considered with the relative importance of each, as follows:

(1) Fitness for special work required (i. e., Is the applicant a machinist?).
(2) General fitness for work (i. e., record of previous jobs).
(3) Physical fitness (i. e., Are you healthy?).

Now, in the Navy the relative position of these factors is:

(1) Physical fitness.
(2) Fitness for special work required.
(3) General fitness for work.

For the "unskilled labor" classes in the Navy, physical examination was in practice during the war, the sole basis of selection.

Studies of the occurrence of nervous and mental disability in the general population show that a nearly constant percentage of such disorders is to be found. For instance, the Nassau County survey[5] shows that 1.72 per cent presented evidence of such disability.

The fact that many of these disabilities are most common in childhood and in old age would make a smaller percentage for those ages eligible for naval service. Yet a study of 2,000 consecutive arrivals

[4] Salmon, T. W. Mental Hygiene, October, 1917.
[5] Quoted in Mental Hygiene, October, 1917.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

at a naval training station[6] showed approximately 4 per cent of nervous or mental abnormalities.

The estimates of the feeble-minded in the general population run close to one-half of 1 per cent. In this series 2 per cent were found, showing that feeble-mindedness is four times as common in the Navy as in the general population. To be sure, many with such a handicap manage to get along in the service. But why should the Navy enlist any man with a handicap when it can get the best?

There are certain factors which tend to drive the unfit into service. Of first importance is economic necessity. I have the word of several prominent social workers that military service of certain individuals during the war took many most troublesome problems off their hands. The adult probation department[7] for the city and county of San Francisco pointed with pride to the fact that nearly 10 per cent of its probationers were in the service. Dr. Walter E. Fernald of the Massachusetts School for the Feeble-minded in a personal communication told me that many feeble-minded under his care were in the service. My own experience in the out-patient department of the Boston Psychopathic Hospital has shown me that the changeable, unsettled psychopaths are often the first to seek service. I have already shown the attitude of some courts during the war in an article in the United States Naval Medical Bulletin[8] and have called attention to the custom of granting freedom to convicted men on condition of enlistment, as there was a general impression that military discipline would reform an incorrigible or cure a psychoneurotic.

There is a very prevalent idea that nervous and mental disease is especially difficult to detect. My own opinion is that no type of disease so definitely marks a man as mental disease, however slight. The marks are quite different from those of physical diseases and must e especially sought to be detected. From the study of the reports of the Surgeon General and Judge Advocate General and of the literature pertaining to military psychiatry, as well as from my own experience in naval service, the special psychiatric problems of the Navy are:

(1) Feeble-mindedness.
(2) Psychoneurosis.
(3) Abnormal personalities.
(4) Epilepsy.
(5) Demential præcox.
(6) Other psychoses and neuroses.
(7) Alcohol and drug addiction.
(8) Bed wetting and stammering.

(The last two conditions are seen most frequently in neurotic and unstable individuals.)

[6] Loc. cit

[7] Annual report of the adult probation department for the city and county of San Francisco for the year ending Dec. 31, 1917.

[8] The detection of undesirable candidates for enlistment, by Passed Asst. Surg. A. W. Stearns, U. S. Naval Reserve Force, U. S. Naval Medical Bulletin, July, 1918, Vol. XII, No. 3.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Now, the problem is, How may physicians not especially trained in psychiatry detect those with nervous and mental disease? Obviously, not by physical examination. No class of disease handicaps to the extent which mental diseases handicaps, and therefore those affected can best be detected by the determination of their social and economic fitness.

Psychiatric studies in the past few years have done much to throw light upon the cause of certain social problems. Especially has it shown the relation between crime, vagrancy, drug and alcohol addiction, pauperism and unemployment, and mental disease or defect. The sociological classification of abnormal subjects in the Nassau County survey, quoted above, is of interest.

TABLE 8.

	Per cent.
Retardation in school	10.6
Truancy, unruliness, etc	1.3
Sex immorality	7.3
Criminal tendency	5.0
Vagrancy	0.1
Dependency	17.6
Inebriety	20.1
Drug habits	0.3
Domestic maladjustment	0.9
Medical cases	3.6
Other groups	23.0
No maladjustment	10.2
Total	100.0

This social and economic fitness can be determined by any intelligent man by analysis of a brief history. Medical officers at recruiting stations, if they have such histories, will soon become expert in their interpretation. In the report for 1917 of the Surgeon General, the fleet surgeon, Atlantic Fleet,[9] deplores the lack of details in history of former diseases in the health record and states that it is "too often made in a perfunctory manner." The history taken on the application for enlistment is even more perfunctory and is of little medical importance at present.

An exact psychiatric diagnosis is not essential. If an applicant appears to be a social or economic problem, it does not matter especially whether this is due to tuberculosis, dementia præcox, feeble-mindedness, abnormal personality, or what not. His problem should not be shouldered by the Navy until man power gets to be a much more serious question than at present. The entire absence of the feeble-minded group among such recruits as hospital apprentices, second class, landsmen for yeomen, and landsmen for electricians (radio) shows that where discrimination is made in selecting the

[9] Annual report of the Surgeon General, 1917, p. 36.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

applicants no defectives are recruited. As for the other groups, many men are now rejected as the result of a superficial judgment upon their fitness, when analysis would show their desirability. The following scheme for determining the social and economic fitness of recruits is suggested:

A minimum life history of each candidate for enlistment should be taken. The following card proved satisfactory at the United States Naval Training Station, San Francisco, Calif., where the writer was stationed during the war.

Name.....Date.....No.....

Age.....Civil cond.....Rate.....

Home.....Enlisted.....

P. E.....Appearance.....

School.....

.....

Occupation.....

.....

Medical history.....

.....

Alc.....Arrests.....

Symptoms.....Fitness 1–2–3

As each question is asked, clues should be followed. The factors of special importance in forming an estimate of the individual seem to be:

1. *Age.*—A considerable percentage of the 18-year-old boys are either 16 or 17 years old. This often means that they have run away from home or have enlisted fraudulently; also many of the bed wetters are on this 18-year-old group, so a little closer attention should be paid to the 18-year old than to others. Also the men above 30 need a little closer inspection, because of the greater frequency in them of cerebrospinal syphilis and chronic alcoholism.

2. *Civil condition.*—Men who are separated or divorced should have a little closer scrutiny because of the association between domestic difficulties and psychopathy.

3. *Relation between home and place of enlistment.*—This is quite important, especially in younger applicants. It is unlikely that a boy under 20 would be applying for enlistment in a distant part of the country if his home life and social relations are normal.

4. *Appearance.*—Under this heading general attitude and manner should be included. Although appearances are very deceptive, one soon learns to detect the dull, childlike reaction of the imbecile, and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the dulled, apathetic reaction of the epileptic or dementia præcox case.

5. *School.*—The grade reached in school and history of retardation is very important in detecting the feeble-minded and epileptic. The eighth grade usually, and high school always, rules out mental defect. Very few epileptics and psychopaths graduate from high school. One should not confuse the rustic with the imbecile, but differential diagnosis is necessary to make the distinction.

6. *Occupation.*—A permanent, responsible job held by a man usually rules out nervous and mental diseases. The imbecile's activities are confined to unskilled labor, and his terms of employment are very short. The psychoneurotic, insane, and epileptic rarely hold a position long.

7. *Medical.*—At least half the epileptics will admit attacks if properly questioned. The same applies to bed wetters. Practically all of the psychoneurotics give a history of previous ill-defined pains, dizzy attacks, or weakness.

8. *Arrests.*—The relation between delinquency and nervous and mental diseases is well known. A history of arrests for minor offenses and of reform-school residence is easy to obtain.

As a result of the above analysis it is possible to place candidates for enlistment in three groups:

(1) Those obviously suffering from neither nervous or mental diseases, comprising at least 80 and probably 90 per cent of applicants.

(2) Those suspected to be suffering from mental diseases, comprising from 5 to 15 per cent of applicants.

(3) Those obviously suffering from nervous or mental diseases, comprising from 1 to 5 per cent.

As a result of this the definite cases should be rejected. The doubtful ones should be more thoroughly studied. Usually by consulting police records of the home town, insisting upon the references being bona fide and investigating these references, one can determine the desirability of the candidate.

If the above method of history taking could be put into operation in all recruiting offices some would use it well and some poorly, but it would unquestionably result in a tremendous diminution in the number of psychopaths received by the Navy, and would require very little additional effort.

CLASSIFICATION OF RECRUITS.

Mental capacity.—The accuracy with which a man's mental capacity can be estimated by psychological tests has not been finally determined. Opinions vary from that which says that life itself is

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the only test to the one which presumes to give final judgment by some pet test. The Binet-Simon scale has everywhere been accepted as an aid in determining feeble-mindedness, and certain tests have proved of value in educational work. It also seems to be quite generally agreed that there is a high correlation between the score made on mental tests and general capacity. Tests for special ability have probably not been so successful. During the war the use of a scale to be given to groups was made a part of the Army routine and the psychological department graded every soldier. The Navy problem is somewhat different from that of the Army because of the absence of illiterate and non-English speaking men. As there is no provision by which specially trained men can be obtained to do testing in the Navy, it is necessary to have a scale which can be used by assistants only slightly trained. In choosing individuals tests for a series it seemed to the writer that the Trabue language scale offered the best already standardized material. After more or less initial experiments Trabue scale *C* was chosen as a nucleus for a series. It has been used exactly as directed in Trabue's book, "Language Scale Tests." To this have been added four other tests, making the the series as follows:

(1) Trabue *C*.
(2) Dissected sentences from Binet-Simon scale.
(3) Cancellation test.
(4) Memory span for numerals.
(5) Healy code.

As the Trabue was scored on a basis of 20, the others have been standardized to this. Three dissected sentences were given in the second test and credit was given only for perfectly constructed sentences. If one was correct, a mark of 6 was given, 13 for two, and 20 for three. Time of three minutes was allowed for the three sentences. For the third test a piece of prose containing 42 "c's" was used and one minute given for canceling the "c's." One was deducted from 20 for each "c" missed, and if less than 22 were canceled a mark of zero was given. For the fourth test three attempts of 5, 6, 7, 8 numerals were given. A credit of 5 was made for one correct series making a total of 20. In the fifth, the Healy code, a sentence of 20 letters was required to be written and credit of 2 given for each correct letter. Thus a total perfect score will be 100.

The distribution of 4,000 scores was plotted. These were at first divided into quarters, which fell at 57, 75, and 86. For utilitarian purposes these groups have been somewhat modified and are now divided as follows:

Group 1: Below 65, inferior.
Group 2: 65 to 75, low average.
Group 3: 75 to 85, high average.
Group 4: 85 to 100, superior.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It will be seen that the score covers the whole range of intelligence, being easy enough so that the most stupid can get something and difficult enough to tax the most brilliant, there being but two zeroes and fourteen 100's in the series of 4,000.

The most important questions to be determined were the meaning of the result of this test and its application. Assuredly there is some difference between the man scoring 65 and the man scoring 85. In order to get the relation between the score and the actual capacity of the man, all recruits entering several schools were graded. Then as they succeeded or failed, completing the course in the school being considered a success and being dismissed from the school being considered failure, this result was correlated with the score. It was soon apparent that there was a tendency to fail on the part of the low men and to succeed on the part of the high. A difficulty encountered was that the schools maintaining a high standard took few low men, while those with a low standard graduated nearly all who entered.

It is apparent that those below 65 (group 1) are so apt to fail in whatever school they may enter that it is wise economy to reject them. It appears from experience with this method that it is more accurate and more fair than either a written school examination, an educational requirement, or a company commander's recommendation. No claim should be made that it is a method of individual study, but it can be said that, with large groups of men and no time for painstaking individual study, it is a method by which success or failure can be predicted in a large enough percentage of cases to make its use expedient. Its use standardizes admissions to the various schools in the Navy as no other form of examination could possibly do.

Besides being of use as a standardized requirement of school entrance, it is necessary from time to time to judge men accurately and no one point is of more value than this score.

Educational classification.—This is relatively unimportant and yet is of some value in estimating a man's worth. During the war there was need of college men on account of their having studied higher mathematics and other things needed by the Navy; and it was noted that those men with meager education were not so readily trained in the various schools.

It appears from this that there is a tendency on the part of college men to make high scores and on the part of those with less than eighth-grade education to make low scores, yet it is impossible to predict a man's score by his education because certain of those with little education make high scores and vice versa. There is some justification in having an educational requirement for admission to the schools, but from our figures it appears that this is not as reliable as the result of a psychological test. There was some difficulty in grad-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ing men according to education because of the diversity of educational institutions in different parts of the United States. As with mental capacity and industrial training, it was desired to put them in four groups—No. 4 was given to college men, and this group comprised all men who had formal education in excess of four years' high school; No. 3 was given to men who had been to high school; No. 2 was given to men who had finished the eighth grade; No. 1 to those who had not finished the eighth grade. Figure 9 shows relative number of each group.

Industrial classification.—The kind of work which an individual has been doing previous to enlistment is of value for two reasons: In the first place it gives an idea of the capacity of the individual; in the second place there is a constant demand in the Navy for men who have had some particular sort of training. Starting with a list including practically all occupations, and another list including the occupations of 10,000 recruits, a final classification including 53 different occupations was used. The vast majority of recruits are relatively unskilled. Many of those who have special skill are of no particular value to the Navy because of this training, so those occupations selected for a place on the list were taken either because there was a demand from the heads of departments for men with a particular training or because it seemed that men with certain occupations ought to be used for special work. Although on the history card what each man was doing prior to enlistment was recorded, only those who have worked a year or more at a particular kind of work were classified. Large groups of unskilled men, such as students and farmers, being of no special value to the Navy, were grouped as "miscellaneous, untrained." Those having skill in some occupation which might be of some use to the Navy, but which rarely occurs, have been grouped as "miscellaneous, trained." The list finally was reduced to 53 different occupations, all of which were at some time or other of use at the training station. Groups were made as follows:

(1) Industrial misfits, such as vagrants, criminals, or those continually shifting work.
(2) Unskilled. Such as farmers and students or day laborers.
(3) Experienced. Those who, although they have not a trade and so would not be considered trained, have had enough experience at a given occupation to make them possibly worth while.
(4) Trained. Embracing highly skilled individuals who have learned a trade or have a profession or business.

In connection with this first group, certain occupations seem to be made up to quite an extent of rolling stones; among these may be

Digitized by Google Original from UNIVERSITY OF MICHIGAN

mentioned hotel and pool-room attendants, longshore workmen, barbers, teamsters, etc. Each one of the 53 occupations was a given serial number which could be used in place of the name when it is desired to express a man's formula numerically. The following is a list of the occupations chosen, preceded by the serial numbers:

1. Actor.
2. Architect.
3. Assayer.
4. Attorney.
5. Auto and motor-truck driver.
6. Athlete.
7. Baker.
8. Barber.
9. Blacksmith.
10. Boilermaker.
11. Bricklayer.
12. Butcher.
13. Carpenter.
14. Cabinetmaker.
15. Chemist.
16. Civil engineer.
17. Cement worker.
18. Cook.
19. Clerk, office.
20. Clerk, store.
21. Clerk, drug.
22. Clerk, post office.
23. Coppersmith.
24. Electrician.
25. Engineer.
26. Foundry worker.
27. Fireman.
28. Interpreter.
29. Jeweler.
30. Machinist.
31. Musician.
32. Motor mechanic.
33. Miscellaneous, trained.
34. Miscellaneous, untrained.
35. Motion-picture-machine operator.
36. Newspaper editor, reporter.
37. Optician.
38. Photographer.
39. Painter.
40. Patternmaker.
41. Plumber.
42. Printer.
43. Pipe fitter, steam fitter.
44. Stonemason.
45. Ship wright.
46. Ship fitter.
47. Sheet-metal worker.
48. Shoemaker.
49. Tailor.
50. Telegrapher.
51. Tinsmith.
52. Toolmaker.
53. Welder.

It was customary to tabulate the arrivals at the training station, classified by occupations, every month and to send this list to the heads of departments, as these men often select persons from this list which they would not otherwise use; also, a cross index by occupations was kept of the entire population of the station and was accessible in case men are wished of any particular trade.

CONCLUSION.

From the foregoing it will be seen that each man was graded according to a standard on a basis of 1–2–3–4, as follows:

Mentally—

(1) Inferior.
(2) Low average.
(3) High average.
(4) Superior.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Educationally—
(1) Less than eighth grade.
(2) Eighth-grade graduate.
(3) High-school students.
(4) College.

Industrially—
(1) Misfits or failures.
(2) Unskilled.
(3) Experienced.
(4) Skilled.

In addition each occupation was given a serial number from 1 to 53. This made it possible to give every man a numerical formula representing his capacity and training. The serial number representing his occupation was put at the right of a decimal point, as it denotes a qualitative factor, the others being quantitative. For instance 444.4 would represent a man of superior intelligence, college education, and highly skilled, his occupation being an attorney. Also 111.34 would mean inferior intelligence, less than eighth-grade education and industrial failure, his work being odd jobs.

This made possible a simple index by which men could easily be located and evaluated. Also each number served as a check upon the other, as a man with a 4 in his formula must be taken seriously, while a 1 means that he should be suspected of incapacity. As a matter of fact the formulas are very consistent, it being rare to find both a 1 and a 4 in the same formula.

APPENDIX A.

Blank Form for Test.

Trabue Language Scale *C*.

1. The sky —— blue.
 Score 2:
 is, was, became, turned, looks, appears, seems.
 Score 1:
 got, is very, is not.
 Score 0:
 are, light, very, dark.
2. Men —— older than boys.
 Score 2:
 are, act, look, appear, seem.
 Score 1:
 grow, were.
 Score 0.
 be, see.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

3. Good boys —— kind —— their sisters.
 Score 2:
 are —— to.
 Score 1:
 were, must be, should be, will be, act, is, —— to.
 are —— with, toward, like, also, and.
 say —— words to.
 Score 0:
 are —— for, as, by.
4. The girl fell and —— her head.
 Score 2:
 hurt, injured, bruised, cut, hit, struck.
 Score 1:
 bumped, knocked, came down on, crushed, fractured, broke.
 Score 0:
 split, busted, on, bunked.
5. The —— rises —— the morning and —— at night.
 Score 2:
 sun —— in, during, —— sets, sinks, disappears.
 Score 1:
 temperature —— in —— falls.
 boy, bird, —— in —— sleeps, rests.
 tide —— in —— also, falls.
 sun —— in —— {falls, goes, leaves, lowers, sits, moon. / goes down, set, not descends, drops, dies. / the moon, fades, never.}
 Score 0:
 sun —— in —— sometimes.
 sun —— every —— sets.
6. The boy who —— hard —— do well.
 Score 2:
 works, tries, studies, thinks, —— will.
 Score 1:
 tries —— can, may, does, shall, should, could, must.
 worked, tried, —— did, will, can.
 plays, hits, work, —— will.
 Score 0:
 tries —— sometimes, surely, often.
 id– work did, does —— work, work —— did.
7. Men —— more —— to do heavy work —— women.
 Score 2:
 are —— {able, competent, willing / inclinded, apt, ready, likely} —— than.
 have —— ability, strength, inclination, power, —— than.
 Score 1:
 are —— {prepared, anxious, eager, liable, fitted / equal, accustomed, suited, satisfied, / capable, used, adapted, wanted, fit, / required, taken, healthy, qualified, / built, stronger, suitable, useful,} —— than.
 are —— {ambition, energy, time, tools / muscle, right, business,} —— than.
 try, like, ought, —— often —— than.
 earn —— money —— than, has —— ability —— than.
 know —— how —— than, eat —— food —— than.
 need —— tools, money —— than, appear —— X —— than.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Score 0:

are —— made, asked, good, active, —— than.
are —— useful, able —— for, work —— hard —— than.
do —— thinking —— than, have —— brains, work —— than.

8. The sun is so —— that one can not —— —— —— directly —— causing great discomfort to the eyes.

Score 2:

brilliant, dazzling, / radiant, bright } {look, gaze / stare, } —— at —— it —— without.

Score 1:

blinding, intense, strong light, / powerful, glary, hot, red fiery, high } —— xx —— at —— without.
x —— endure, bear, stand, —— its —— rays —— without.
x —— xx —— into, toward, towards, —— it —— without.
x —— blinding, intense, —— xx —— at —— it —— unless, for if.
x —— even —— look —— up —— without.

Score 0:

warm, far, low —— xx —— at —— it —— without.
x —— xx —— at —— it —— because, thus.
x —— se —— it —— so —— without.

9. The knowledge of —— —— use fire is —— of —— important things known by —— but unknown —— animals.

Score 2:

how —— to —— one —— {the, many / several} —— {man, eman, us, / mankind, / people} —— {by, / among, / to.}

Score 1:

how —— to —— one —— x —— persons, scouts, humans, —— xxx.
why —— we —— one —— x —— xx —— xxx.
when, having, the way, —— to —— one —— x —— xx —— xxx.
how —— to —— considered, rated, thought, —— x —— xx —— xxx.
how —— to —— one —— most —— xx —— xxx.

Score 0:

how —— to often —— x —— xx —— xxx.
the —— {proper, correct careful, / important, skillful, great, } —— one —— x —— xx —— xxx
knowing —— how to —— one —— x —— xx —— xxx.

10. One ought to —— great care to —— the right —— of —— for one who —— bad habits —— it —— to get away from them.

Score 2:

use, take, / exercise, } —— {form, choose, / acquire, gain, / cultivate, / develop, adopt, / establish, / learn, teach, / begin } —— {sort, / kind, } —— habits ——

{has, gains, contracts, / forms, acquires / contracts, } —— finds —— {hard, / difficult.

x —— xx —— habits —— {living, life, working, / work, studying, study, / speaking, speech, thinking, / thought, learning, mind, / procedure, action, / attention, acting } —— x —— x —— xx.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Score 1:

x —— {obtain, get / possess, use, / have, pursue, / make, lead,} —— {xx —— habits / habits —— xxx} —— x —— finds —— xxx.

xx —— xx —— xxx —— habit —— {x, gets, / finds} finds {impossible, / pays.}

x —— xx —— {xxx —— habits / habits —— xxx} —— x —— {has / makes} —— xx.

{have / give} —— xx —— {habits —— xxx / habits —— xxx / habits —— xxx} —— x —— finds —— xxx.

take —— use —— xxx —— speech —— x —— finds —— xxx,

x —— be —— xxx —— person —— x —— finds —— xxx.

x —— xx —— habits —— {morality, / manhood} —— x —— finds —— xxx.

x —— begin —— way —— living —— x —— finds —— xx.

x —— do —— xxx —— things —— x —— finds —— xx.

x —— do —— thing —— course —— x —— finds —— xxx.

Score 0:

x —— {get —— start —— life / do —— thing —— life} —— x —— finds —— xxx.

2

1. Hour —— for —— we —— early —— at —— park —— an —— started —— the.

2. To —— asked —— exercise —— my —— teacher —— correct —— my —— I.

3. A —— defends —— dog —— good —— his —— courageously —— master.

3

One hears very different judgments in the value of life. Some say it is good, others say it is bad. It would be more correct to say that it is mediocre; because on the one hand it brings us less happiness than we want, while on the other hand the misfortunes it brings are less than others wish for us. It is the mediocrity of life that makes it endurable; or still more, that keeps it from being positively unjust.

APPENDIX B.

Instructions for Giving Stearns Test.

In giving the directions for these tests, it is essential that every point be clearly understood by everyone who is capable of understanding. This can be assured in no other way than by giving the directions slowly and distinctly with proper expression and emphasis. Before being given it should be seen that the test is clearly understood. In order that the meaning of each sentence may be fully grasped, it should be followed by a pause. A good rule is to allow a pause of two seconds after every sentence. The procedure may only be considered as standardized on the condition that the examiner adheres to this rule uniformly throughout the testing.

Introductory.—This examination is given as an aid in finding for what special work you are best qualified. These papers [indicating] will be passed to you, printed side down. Do not turn them over until you are told to do so.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Has every man a paper? Has every man a pencil? Now at the top of the blank side of the paper write, (1) your full name, (2) your rate and company number, (3) the highest grade you completed in school, (4) your occupation before entering the Navy. Everyone should now have, the name, rate, company number, extent of schooling, and occupation recorded on the sheet.

This examination consists of five different tests. You will do one test at a time. At the order "Begin writing" you will turn your paper over and begin work. You will be allowed a reasonable time to complete each test, so do not hurry through them, but keep your mind on the tests and work steadily. As soon as you have completed the test or when the command "Papers over" is given you will turn your paper over "printed side down."

Test I (Trabue Language C).

This test is to see how quickly and how accurately you can complete 10 sentences, which have certain words omitted. Place one word only in each blank space.

"Ready to begin."
"Begin writing."
"Paper over" (after 7 minutes).

Test II (Dissected Sentence).

The next test consists in seeing how quickly and how well you can rearrange three groups of words into sentences. The words comprising each sentence are now transposed so they do not make sense. To make a sentence of these words they should be placed in natural order. Use every word which you find under each group.

"Ready to begin."
"Begin writing."
"Paper over" (after 3 minutes).

(Score 6 for one correct sentence, using all words but once, 13 for two, and 20 or three sentences.)

Test III (Cancellation Test).

The next test consists in seeing how quickly and how accurately you can cross out all of the "E"s in a paragraph of reading matter taken from a newspaper. Draw a line through each letter "E."

"Ready to begin."
"Begin writing."
"Paper over" (after 1 minute).

(Deduct 1 from 20 for each "E" omitted. Score 0 for less than 22 cancelled.)

Test IV (Memory Test).

The first order for this test is for you to hold your pencils up, resting your elbow on the table. Now turn your papers over, keeping your pencils up.

This test consists in seeing how many numbers you can remember. First I will read five numbers. When I have finished reading, at the command "Write" you will write the figures on the first part of the first line. Then you will hold your pencils up and I will give you five more numbers which you will write on the middle part of the first line, and then five more which you will write on the last part of the first line.

"Ready to begin."
47395—"Write."
"Ready."
58379—"Write."
"Ready."
85264—"Write."

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Now I will give you six numbers which you will write on the second line.

"Ready to begin."

854726—"Write."

"Ready."

274681—"Write."

"Ready."

941738—"Write."

Now I will give you seven numbers which you will write on the third line.

"Ready."

2947375—"Write."

"Ready."

1695847—"Write."

"Ready."

9285164—"Write."

Now I will give you eight numbers which you will write on the fourth line.

"Ready."

28574692—"Write."

"Ready."

27859513—"Write."

"Ready."

83962754—"Write."

"Papers over" (no time limit).

(Score 5 if one of three of 5 digits is entirely correct. Then the same with 6, 7, 8 figures.)

Test V (Observation Test).

Sometimes in war it is necessary to send secret messages. For this purpose codes or ciphers are used. I am going to give you a code used by the southern army in the Civil War and later ask you to write words using the code from memory.

(Place code on blackboard.)

Each letter is represented by the lines which inclose it, i. e.:

A, B, C, etc.,

S, T, U, V.

You will observe that the second group of squares is distinguished from the first group by the dot in each angle, and likewise the second group of crosses is distinguished from the first by the dot in the angle. Observe further that the letters in the first two groups run from top to bottom and in the second two groups in a counterclockwise fashion.

Now let me illustrate the use of the code. We write the word "war" thus [indicating].

I am going to ask you to write a phrase on the bottom line of your paper opposite number "5" using the code as you remember it.

"Ready to begin."

"Write"—"Caught a spy."

"Paper over" (after 3 minutes).

(Score 2 for each letter given correctly.)

The total possible score for all tests is 100.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

THE INSULIN TREATMENT OF DIABETES MELLITUS.[1]

By W. D. Owens, Lieutenant Commander, Medical Corps, United States Navy.

In recent years internal medicine has made remarkable progress, but there has been none greater than in the clinical investigation and scientific treatment of diabetes mellitus. Since the classical observation of Thomas Willis in 1675, that the urine in diabetics contained sugar, until the announcement of the discovery of insulin by Banting and Best of the University of Toronto, probably no other disease has been the object of so much combined clinical and laboratory study.

The discovery by Banting and his coworkers of an effective nontoxic pancreatic extract must undoubtedly be regarded as an epoch in the therapy of diabetes and as one of the greatest medical achievements of the time. Nevertheless, their work can in no way distract from the importance of the investigations of Allen, Joslin, Woodyatt, Newburg, and Marsh, whose clinical and laboratory studies in the dietetic treatment of diabetes mellitus had even before the discovery of insulin accomplished far-reaching results. This may be appreciated by presenting the following statistics of Joslin:

Between the years 1814 and 1914 the death rate from diabetes in patients who were treated in the best hospitals was 28 per 100 per year. The year 1914 marked a significant advance in the dietetic management. Allen's undernutrition treatment was adopted, and in patients so treated the death rate had fallen to 4 per 100 each year.

To-day the possibilities of treatment are even greater, and by the use of insulin the death rate from diabetes should be reduced to the neighborhood of zero. Patients who would otherwise remain chronic invalids, subjected to frequent fast days and undernutrition, may be sufficiently restored to health to take their rightful place in the world, earning their living and free to enjoy some of the pleasures of life.

In the management of diabetes there are five objects to be attained:

(1) The patient should be kept continually free from sugar in the urine, and the blood sugar should be within normal limits.
(2) The patient should be kept continuously free from acidosis.
(3) The patient should be nourished as evidenced by a satisfactory weight.
(4) All sources of chronic foci of infection should be determined, and where practicable they should be eliminated.
(5) Gastric analysis should be accomplished because achylia may be the cause of the failure of the pancreas to function.

[1] This paper deals with a series of 12 cases of diabetes mellitus treated with insulin by the staff of the naval hospital, San Diego, Calif.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Before undertaking the treatment of diabetes one should understand the blood changes which occur, and thoroughly master the principles of the dietetics involved.

To attempt a serious discussion of the blood sugar of the normal individual and of the diabetic is beyond the scope of this paper, but a few of the fundamentals may be advantageously indicated. In the normal healthy individual the blood, when examined three or four hours after a meal, or in the morning before breakfast, will be found to contain about 0.1 per cent of sugar. Under certain circumstances it may be a little higher or a little lower than this, but the normal figure of 0.1 per cent (100 milligrams per 100 c. c.) of blood sugar may be accepted as the normal for the average person.

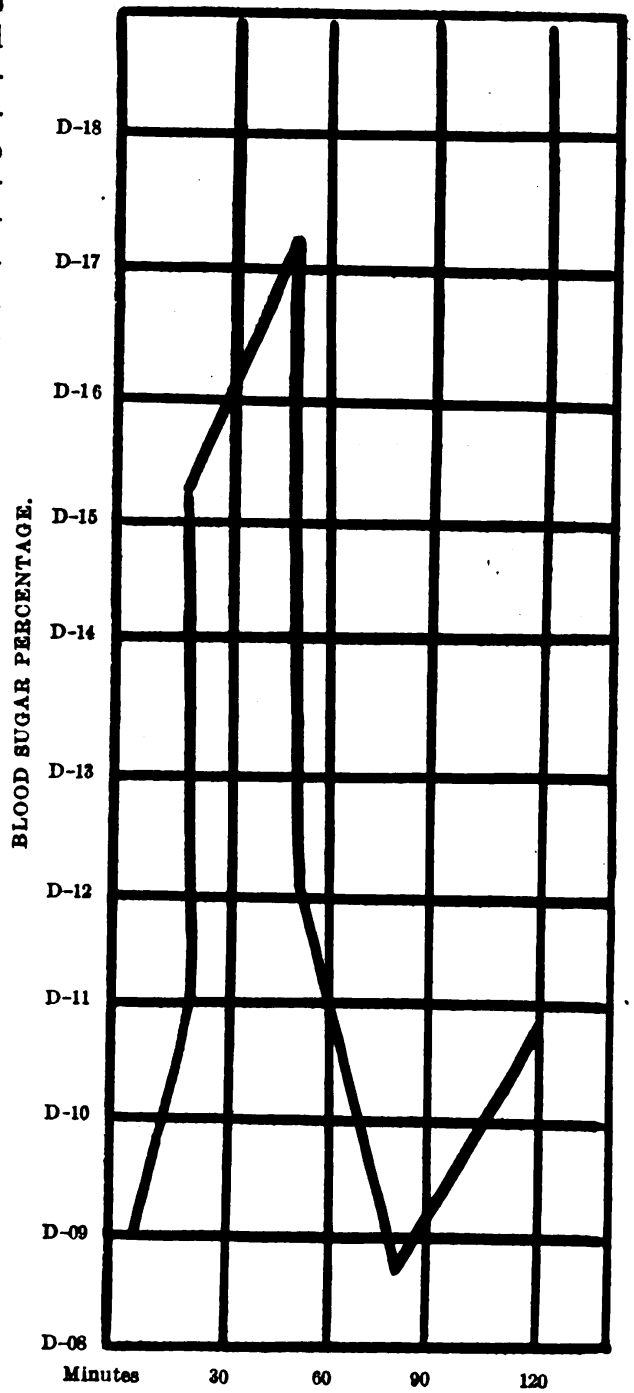


FIG. 1.—Blood sugar curve of normal individual.

After an ordinary mixed meal the blood sugar rises very considerably within the first half or three-quarters of an hour; it then decreases, and within one and a half to two hours after taking a meal it again returns to the region of the normal value. A sugar curve obtained from a normal individual is shown in Figure 1; here 50 grams of glucose were administered. This chart emphasizes that one should take specimens for blood sugar estimations at least three hours after the ingestion of a meal, because a blood-sugar report of 0.17 taken a half hour after a meal would have no value whatsoever.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The extent to which the blood sugar can be raised in the diabetic person varies somewhat with different individuals, but it may be accepted that the maximum concentration which can be present in the blood without the occurrence of glycosuria is 0.18. In the normal individual sugar will not appear in the urine by feeding with an excess of glucose.

The maximum value of 0.18 per cent is known as the renal threshold value for sugar and represents the concentration below which no sugar is excreted with the urine. One may infrequently encounter cases presenting a low renal threshold and this condition is known as renal glycosuria. We have had one such case admitted into this hospital during the past year. The blood sugar estimation was normal and a sugar tolerance test failed to give the characteristic diabetic curve. The patient was finally discharged as with no disease.

In the diabetic individual the blood sugar is above normal when one makes an estimation immediately or several hours after the taking of a mixed meal, and Figure 2 shows the curve obtained from a moderately severe case of diabetes after the eating of 50 grams of glucose. It will be noted that the blood sugar is 0.23 four and one-half hours after the administration of glucose. The highest blood sugar in our series is 0.5, taken three hours after meals. This patient has an internal cataract in the left eye and severe retinitis in both eyes. In a communication received from Doctor Joslin he states that one can not expect much change in retinitis with insulin therapy.

From what has been said it is evident that when glycosuria occurs in diabetes the blood sugar must be more than 0.18. When it goes to a slightly lower level, then the glycosuria at once ceases. In some diabetic patients, however, and more especially in elderly individuals, the renal threshold value for sugar may be considerably raised so that even 0.3 or more sugar may be present in the blood without glycosuria. In such patients urine examinations are most deceptive and frequent blood sugar estimations are necessary to properly estimate the condition. One case of this character has been under observation and for a time greatly puzzled Doctor Sumerlin and myself. The absence of sugar in the urine, therefore, does not tell us whether the blood sugar is subnormal or in the neighborhood of normal or possibly higher, and it is for this reason that the administration of insulin at certain times may bring on symptoms of hypoglycemia. Whenever the blood sugar goes as low as 0.07 definite symptoms of hypoglycemia may appear, and should the blood sugar reach as low as 0.03 death will occur.

It would seem that one of the greatest benefits which the staff of the hospital has derived in the treatment of this series of cases with insulin has been to stimulate an interest in the art of dietetics.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The advent of insulin has not rendered the dietetic treatment of diabetes of less importance, but of more importance. Much can and should be done to advance dietetics in the naval service. The Surgeon General appreciates the situation, and he has recently organized a class of nurses to be given dietetic instructions in Boston.

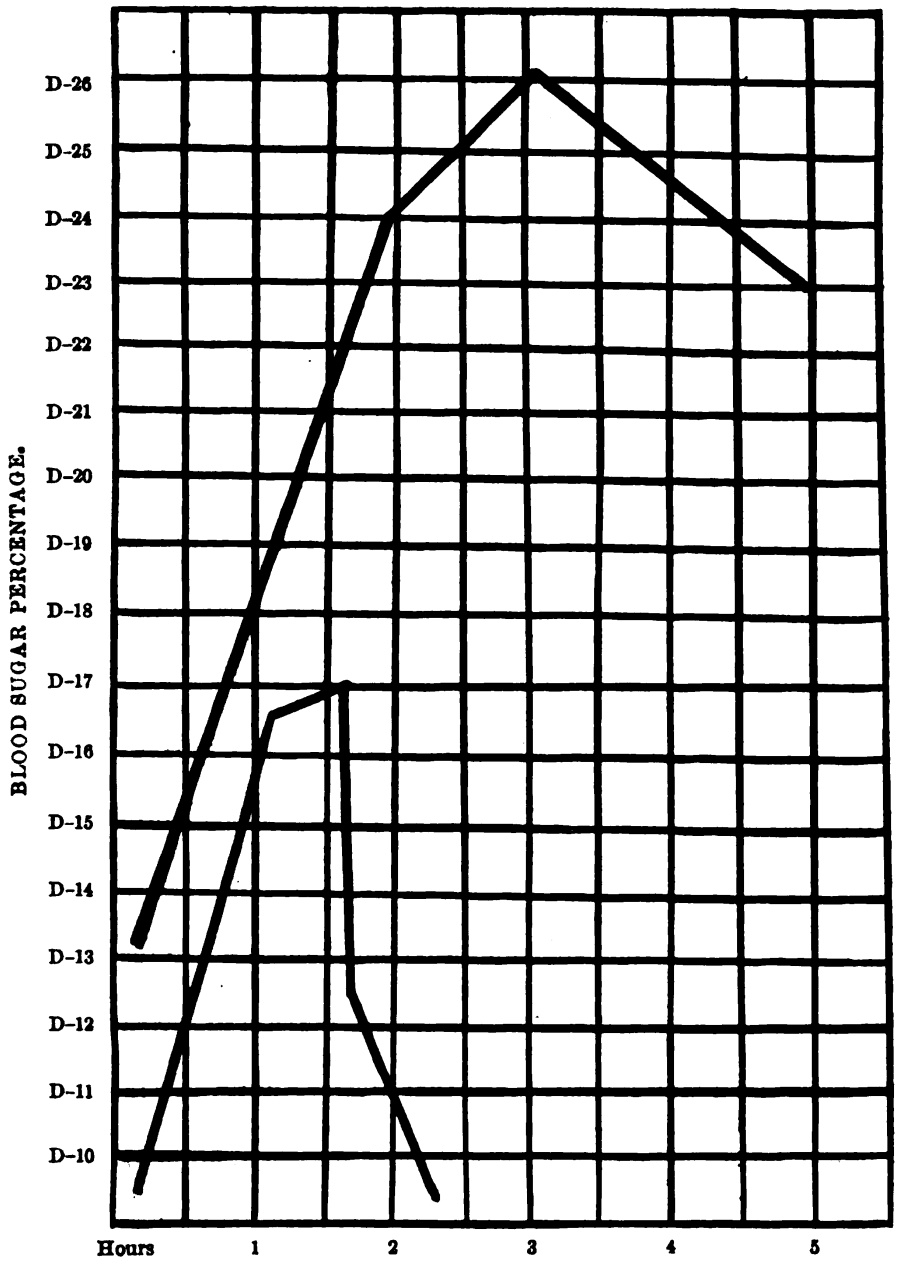


FIG. 2.—Diabetic (upper) curve compared with normal (lower) curve.

In order to meet the situation temporarily at this hospital, I have been giving lectures and practical demonstrations to groups of nurses, and eventually all the nurses will have an intelligent understanding of the fundamentals of the dietetics involved in the treatment of diabetes. I wish to take this opportunity to thank Miss Cox and

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the nurses for their cooperation and interest in our efforts in this direction. Diets are now scientifically estimated, properly weighed, and their caloric value recorded. Figure 7 shows a diet order used at the Mayo Clinic and adopted by us.

FIG. 3.—*Insulin diabetic diets.*

	Diet.	Total diet.				Carbohydrate (C).						Protein and fat (PF).				
												Cream.				
		Carbohydrate.	Protein.	Fat.	Calories.	5 per cent vegetables.	Orange.	Oatmeal.	Shredded Wheat.	Uneeda.	Potato.	Egg.	20 per cent fat.	Bacon.	Butter.	Meat.
Test	T. D. 1	181	46	44	1,304	300	300		3	4	240	3	120			
	T. D. 2	101	35	43	931	300	300		1	2	120	3	120			
	T. D. 3	66	24	37	693	300	300		½	2		2	120			
	T. D. 4	34	15	30	466	300	300					1	120			
Maintenance	C1-PF1	14	15	30	386	300						1	120			
	C2-PF2	22	19	37	497	300	100					2	60		15	
	C3-PF3	32	24	37	557	600	100					2	60		15	
	C4-PF4	42	29	52	752	600	200					2	60	30	15	11
	C5-PF5	52	32	66	930	600	200	15				2	60	30	30	
	C6-PF6	64	44	83	1,179	600	200	30				2	120	30	30	30
	C7-PF7	74	52	88	1,296	600	300	30				2	120	30	30	60
	C8-PF8	84	61	94	1,426	600	300	30		2		2	120	30	30	90
	C9-PF9	98	65	106	1,606	600	300	30	½	2		2	180	30	30	90
	C10-PF10	109	66	119	1,771	600	300	30	1	2		2	180	30	45	90
	C11-PF11	135	80	135	2,075	600	300	30	1	2	120	2	240	30	45	120
	C12-PF12	159	84	135	2,187	600	300	30	1	2	240	2	240	30	45	120

The dietetic fundamental requirements in the treatment of diabetes mellitus may be briefly stated as follows:

By means of test diets, such as Joslin's (Fig. 3), one determines the minimum amount of food which will enable the patient to become free from glycosuria and, if possible, from acetonuria. To do this it is necessary to ascertain what amounts of the three ordinary classes of food—carbohydrates, proteins, and fats—should be present in the diet in such quantities as to keep the patient's urine sugar free and the body sufficiently nourished.

In order to accomplish this one must think of food values in terms of calories. For clinical purposes it is sufficiently accurate to assume that 1 gram of carbohydrate equals 4 calories; 1 gram of protein equals 4 calories; 1 gram of fat equals 9 calories, and that a patient will require, roughly, from 12 to 15 calories for every pound of body weight. Thus, a man weighing 140 pounds would require as a minimum 1,700 to 2,000 calories. The average requirements of people concerned in the less strenuous occupations is 3,000 calories daily. Troops during war frequently get as high as 5,000 calories, and a hard laboring man needs fully 6,000 calories daily. In the treatment of diabetes when the maintenance diet is low in caloric values it is frequently necessary to keep the patient in bed, as it requires from 20 to 50 per cent increase in calories when the patient is up and about, depending on the physical exercise or occupation permitted.

Having determined the number of calories necessary, it is now essential to decide what amount of the different classes of foods should

Digitized by Google Original from UNIVERSITY OF MICHIGAN

be given to make the requisite calories. The protein foods must be administered in sufficient quantity to maintain health. This amount is generally estimated at about half a gram of protein per day for each pound of body weight. Thus, the patent weighing 140 pounds will need 70 grams of protein.

The carbohydrates are the great sugar formers and it is evident that an enfeebled carbohydrate mechanism should be treated with the utmost consideration and that the carbohydrates should be decidedly restricted. One should now select some method of starvation and carbohydrate restriction in order to determine the point when the urine will become sugar free.

FIG. 4.—*Foods arranged according to carbohydrate content.*

1–3 per cent.	3–5 per cent.	10 per cent.	15 per cent.	20 per cent.
VEGETABLES (FRESH OR CANNED).				
Lettuce.	Tomatoes.	String beans.	Green peas.	Potatoes.
Cucumbers.	Brussels sprouts.	Pumpkin.	Artichokes.	Shell beans.
Spinach.	Water cress.	Turnip.	Parsnip.	Baked beans.
Asparagus.	Sea kale.	Kohlrabi.	Canned lima beans.	Green corn.
Rhubarb.	Okra.	Squash.		Boiled rice.
Endive.	Cauliflower.	Beets.		Boiled macaroni.
Marrow.	Eggplant.	Carrots.		
Sorrel.	Cabbage.	Onions.		
Sauerkraut.	Radishes.	Green peas, canned.		
Beet greens.	Leeks.			
Dandelion greens.	String beans, canned.			
Swiss chard.	Broggoli.			
Celery.	Artichokes, canned.			
Mushrooms.				
FRUITS.				
Ripe olive (20 per cent fat).		Watermelon.	Raspberries.	Plums.
Grapefruit.		Strawberries.	Currants.	Bananas.
		Lemons.	Apricots.	Prunes.
		Cranberries.	Pears.	
		Peaches.	Apples.	
		Pineapple.	Huckleberries.	
		Blackberries.	Blueberries.	
		Gooseberries.	Cherries.	
		Oranges.		

	30 gm. 1 oz. contains approximately—			
	Carbohydrates.	Protein.	Fat.	Calories.
	Grams.	*Grams.*	*Grams.*	*Grams.*
Oatmeal, dry weight	20	5	2	118
Shredded wheat	23	3	0	104
Uneeda biscuits, two	10	1	1	53
Cream, 40 per cent	1	1	12	116
Cream, 20 per cent	1	1	6	62
Milk	1.5	1	1	19
Brazil nuts	2	5	20	208
Oysters, six	4	6	1	49
Meat (cooked, lean)	0	8	5	77
Chicken (cooked, lean)	0	8	3	59
Bacon	0	5	15	155
Cheese	0	8	11	131
Egg, one	0	6	6	78
Vegetables, 5 per cent ground up	1	.5	0	6
Vegetables, 10 per cent ground up	2	.5	0	10
Potato	6	1	0	28
Bread	18	3	0	84
Butter	0	0	25	225
Oil	0	0	30	270
Fish: Cod, haddock (cooked)	0	6	0	24
Broth	0	.7	0	3

74459—24——3

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The proteins and carbohydrates having been ascertained, the intended value in calories is made up from fats. Woodyatt, whom I recently heard talk at the American Medical Association convention in San Francisco, has for many years opposed the views advanced by Allen, that fats must be rigorously restricted in diabetic diets and the very excellent clinical results obtained by Newburgh and Marsh since 1920 have gone far to prove Woodyatt's contention. To-day the high fat diet is accepted and we have followed Woodyatt's formula; i. e., that the amount of fats is not to exceed twice the carbohydrates plus one-half the protein. We have a patient on a diet consisting of 108 grams of carbohydrates, 65 protein, and 240 fats, and although he frequently shows acetone in his urine there have been no unhappy effects. It may be of interest in connection with this patient, who happens to be a Veterans' Bureau case, to recite the following instance: This man, in order to be transferred east, wrote to friends and made certain unfavorable comments in regard to the quantity and character of the food he was receiving. The commanding officer in reply to the correspondence very aptly showed that this patient was receiving a scientific diet based on the metabolin requirements of the body in accordance with Wilder's charts. He also was able to remark that under the dietetic restriction and 80 units of insulin daily the patient had gained 32 pounds in six weeks.

About a year ago Wilder described a system of planning diets which include a lowering of the metabolic rate without loss of body tissue, low protein, low carbohydrate, and a safe ratio between the ketogenic and antiketogenic substances, and recently we have used Wilder's method to guide our treatment. Figures 5 and 6 explain Wilder's charts and may be purchased from Sanders & Co. for $1 for each set.

More recently, in an article entitled "The use of fat in diabetes mellitus and the carbohydrate fat ratio," by Ladd and Palmer, which appeared in the archives of Internal Medicine, the authors advocate that fats may be given in the proportion of carbohydrates 1 to fats 4, but so far we have only employed Woodyatt's formula. In this connection Dr. Max Kohn, of Beth Israel Hospital, of New York, has announced the production of a new fat preparation having 17 carbon items to the molecule, intermediate between the ordinary fat containing 16 and 18 carbon atoms and incapable of breaking down in acid products as do natural fats. This substance is named *intarvin* and is now being manufactured and will soon be placed on the market.

One of the most important functions of an institution in the management of diabetes is the education of the patients and the personnel assisting in the care of these patients. Either the patient or some member of the family should be fully instructed in the funda-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

mentals of dietetics. The patients should know enough to plan and weigh their meals in accordance with some standard diet table, such as Joslin's (shown in fig. 4). The patients should be persuaded to study special books on dietetics, such as Joslin's or the Mayo Clinic volume. They should be taught the fundamentals of insulin therapy, the time and frequency of administration, also the symptoms and treatment of an overdose of insulin. Before discharge, they should be able to do a Benedict test for glycosuria and know the significance of the various reactions. It has been my experience that when patients are required to perform their own Benedict test one is sure to have a more intelligent dietetic cooperation, and the patient soon shows as great concern for a positive reaction as the physician. One of my patients, a lady who has a very intelligent idea of dietetics, called me on the telephone and with some alarm informed me that her urine showed a trace of sugar that morning. This patient was taking 5 units of H10 insulin twice daily. I questioned her as to any dietary indiscretions. After considerable persuasion it was learned that she had indulged in two fresh figs. I estimated that the sugar-forming value of two figs would require approximately 1 extra c. c. of H10 insulin. This instance emphasizes the importance of dietetics when giving the insulin treatment for diabetes. Each unit of insulin can assimilate so many grams of sugar formers and no more, and if one strays from a given diet, one needs more insulin.

The patient should be instructed in regard to the relation of chronic foci of infection to diabetes; the necessity of having the teeth, tonsils, and sinuses investigated; the relation of boils, carbuncles, and other infections to diabetes, and the effective action of insulin controlling these infections. To accomplish this educational plan we have invited patients or members of their families to attend the course of lectures given to the nurses, and the value of these talks have fully compensated for the work involved.

So far I have discussed the general management of diabetes. In employing insulin in the treatment of diabetes mellitus there are four conditions that should be satisfied:

(1) The sugar-forming or utilizing power of the insulin in grams per cubic centimeter should be known.
(2) The patient's natural tolerance should be determined in grams of sugar formers.
(3) The exact value of the proposed diet should be known.
(4) The dosage of the insulin may then be adjusted to make up the difference between the sugar formers of the proposed diet and those of the patient's natural tolerance.

When estimating the sugar formers of the three classes of foods and the metabolizing power of insulin, we would do well to keep in mind that the values obtained are not definite. Even with the present

Digitized by Google Original from UNIVERSITY OF MICHIGAN

standardization of iletin, and supplemented by clinical tests, the finished product may vary from 5 to 10 per cent. Therefore one should gradually approach the administration of the determined dose of insulin while keeping the blood sugar and urine under observation.

In the treatment of this series of cases, we have employed the H10 and H20 Eli Lilly iletin. On October 15, 1922, Lilly & Co., in accordance with directions from the insulin committee of the University of Toronto, released a new issue of iletin having a potency 40 per cent higher than heretofore. The new issue will replace the H10 and H20, which will henceforth be known as U10 and U20. The calculations here presented are based on the new values of U10 and U20.

The sugar-burning or utilizing power of the insulin should be known. Eli Lilly's iletin is evaluated in rabbit units. Their units have a fairly constant value, since they use between 300 and 400 rabbits in the standardization of each lot. It is estimated that each unit is worth a little more than 1½ grams of sugar metabolizing power. The U20 product which indicates 20 rabbit units in each c. c. has a sugar metabolizing power of approximately 35 grams. The U10 has a metabolizing power of approximately 17½ grams. The U20 iletin is of advantage where one desires to give the larger doses, say, over 2 c. c. a day.

Knowing the sugar-forming power of iletin, one must next determine the value in sugar formers of the diet which the patient is able to maintain without the occurrence of glycosuria and the value in sugar formers of the diet which it is intended to give the patient in conjunction with iletin.

The reduction of food values and tolerances to the common denomination *sugar formers* materially simplifies our calculations. The sugar formers of the diet are 100 per cent of carbohydrates, 58 per cent of proteins, and 10 per cent of the fats. The patient's tolerance may be determined by diet alone, or by diet plus insulin. When diet alone is used, the patient is desugarized by partial starvation. When sugar free, diet additions are gradually made. (Fig. 3.) A diet is eventually found upon which the patient can remain continuously free from sugar in the urine, and with a normal blood sugar. Suppose such a diet contains 35 grams of carbohydrate, 33 grams of protein, and 83 grams of fats. In estimating the sugar formers of the three classes of food, the carbohydrates are 100 per cent sugar formers, the proteins 58 per cent, and the fats are 10 per cent. Thus the diet containing 35 grams of carbohydrate would yield 35 grams of sugar formers, the 33 grams of protein would yield 19 grams of sugar formers, and the fats 8 grams, making a total of 62 grams of sugar formers. Hence the natural tolerance for this patient would be 62 grams of sugar formers.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The caloric value of such a diet is 1,400 calories or hardly enough to meet the patient's body requirements necessary to perform a certain occupation. It is estimated that this patient will require 2,000 calories of food or an increase of slightly over 30 per cent in the caloric value. It is therefore proposed with the assistance of

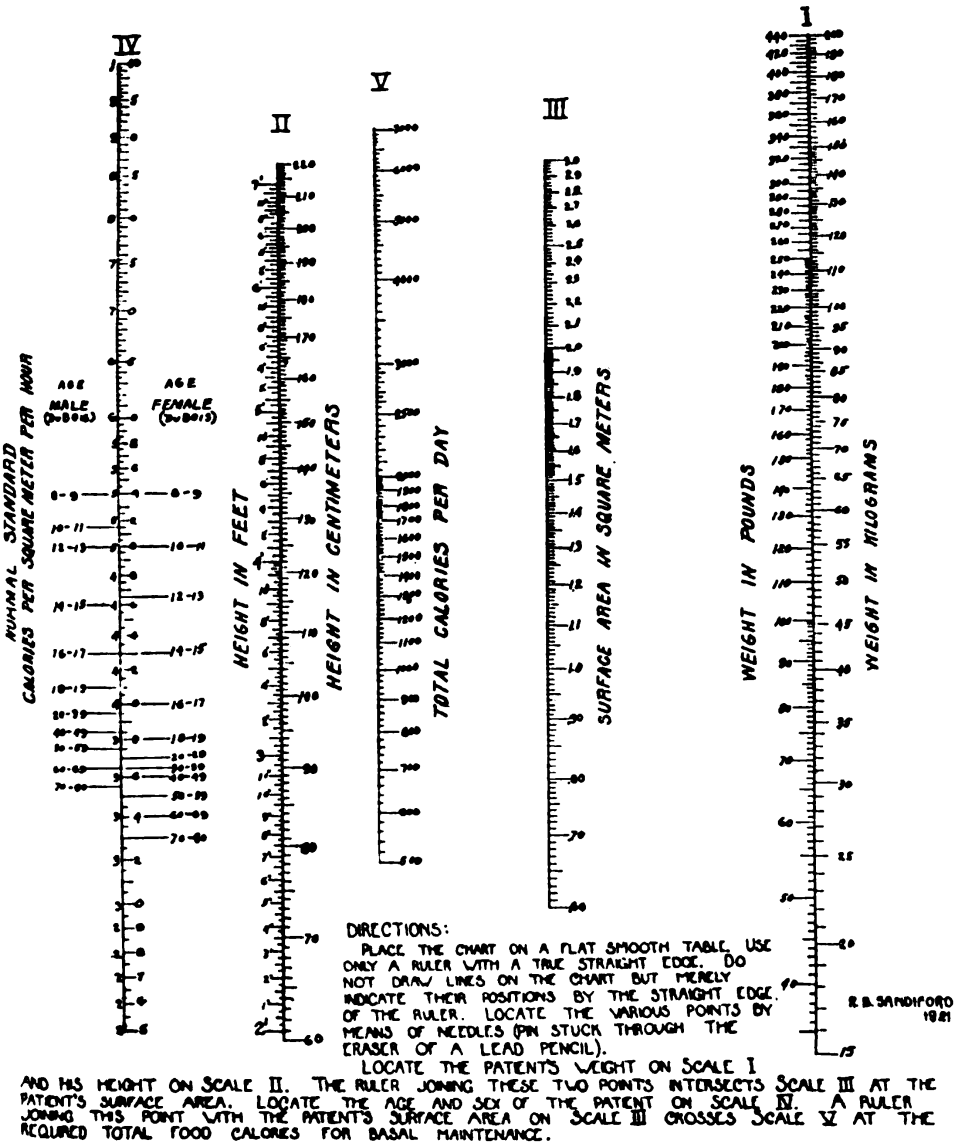


Fig. 5.—Diabetic diet. Chart No. 1

insulin to give this patient 80 grams of carbohydrates, 70 grams of protein, and 145 grams of fats, having a total caloric value of approximately 2,000 calories. The sugar formers of such a diet is 135. We have already estimated that the sugar formers of the maintenance diet is 62; hence the patient will need 135 less 62, or 73 grams of insulin assistance, in order to accommodate the diet having a value

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

of 2,000 calories. If 73 is divided by 35, it will indicate the number of c. c. of U20 Lilly iletin required, and would amount to 2 c. c. in round numbers. If the U10 is used, one needs to administer 4 c. c. of insulin daily.

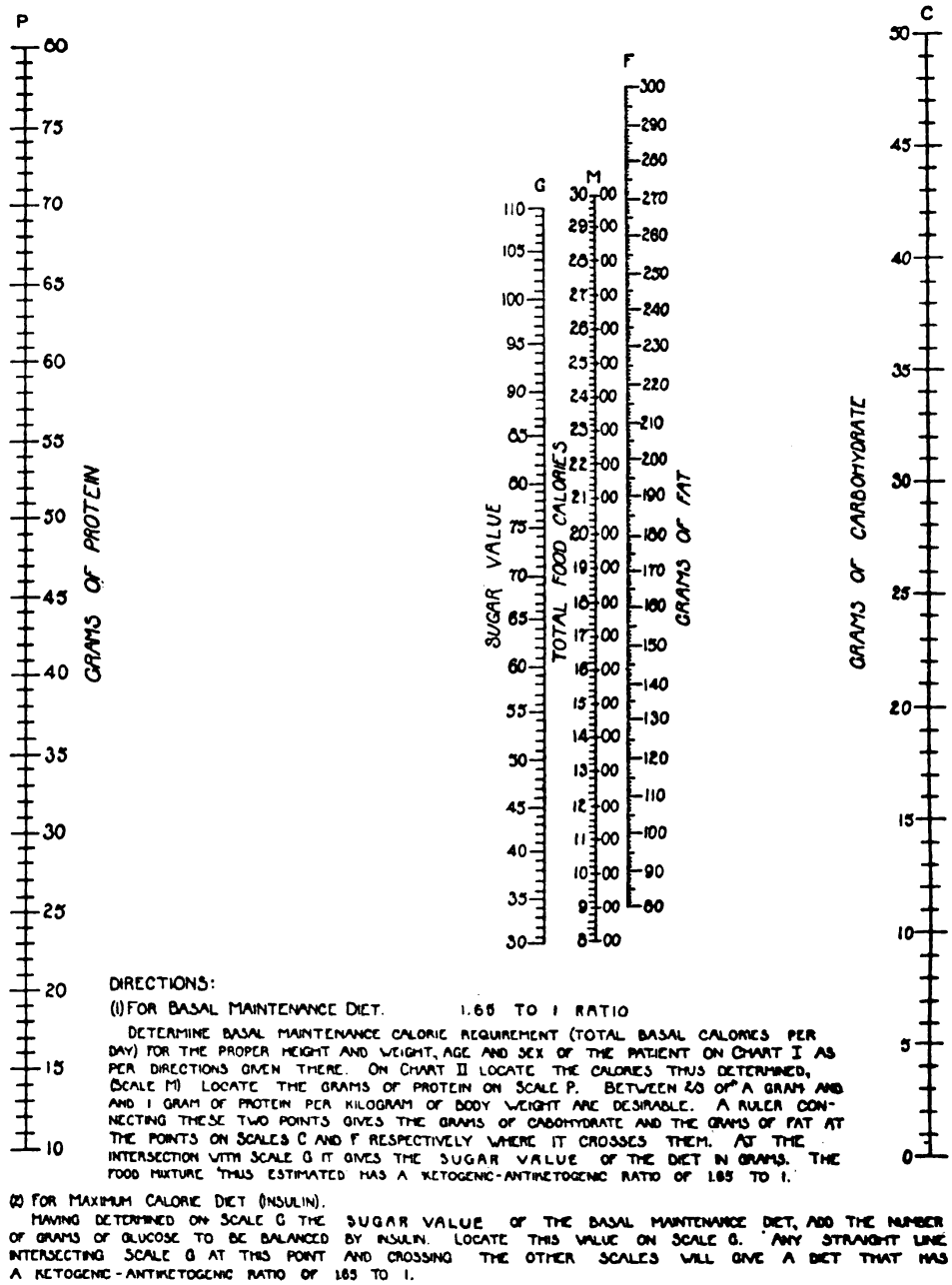


FIG. 6.—Diabetic diet. Chart No. 2.

In our experience we have found that in the majority of patients with a fairly equal distribution of food between the three meals of the day five-eighths of the total dose should be given before breakfast and three-eighths before supper. In this instance we would give

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

1¼ c. c. before breakfast and ¾ c. c. before supper. When starting the insulin treatment, it is well to begin with only one unit of U10 iletin, as Joslin states that even one unit of U10 has dangerously reduced the blood sugar. One of my patients prefers to take only two meals a day and the noon meal is the heavy one. As the result of insulin treatment, the patient's tolerance has increased and the insulin has been reduced from 2 c. c. to ½ c. c. daily. This amount administered before the first meal satisfactorily meets the requirements of both meals.

In the discussions of blood-sugar changes I indicated that when the patient's blood sugar reached as low as 0.07 certain symptoms of hypoglycemia appeared. Symptoms incident to an overdose of insulin were of frequent occurrence during the early stages of investigation, when insulin was not so accurately standardized, but even now one may encounter them, particularly during the early weeks of treatment, when by keeping the patient continuously free from acidosis and urinary sugar the tolerance usually increases very rapidly. Under these conditions the symptoms of an overdose are usually mild and easily treated, especially if the patient is taught to recognize them early.

The symptoms of hypoglycemia are as follows:

Hunger: As a patient's blood sugar falls he usually experiences a keen appetite. In this connection it must be realized that all diabetics are naturally hungry.

Slow mentality: The patient may complain that he can not think clearly.

Extreme weakness and dizzy feelings: These symptoms of overdosage are frequent and are probably the most reliable early symptoms.

Rapid pulse and respiration are fairly common.

Visual disturbances: These may be double vision, and dark spots may appear before the eyes.

Shaky feelings: The words "shaky" or "the shakes" have been established by the patients themselves and seem to describe in a satisfactory manner the patients' own feelings.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

FIG. 7.—*Diabetic diet orders.*

No.--------- Name---------- Date----------
Bed No-------- Table No----------
Diet Rx---------- COH---------- Prot---------- Fat----------

Food.	Breakfast.	Dinner.	Supper.	Grams. Total grams.	COH.	Prot.	Fat.
5% vegetables							
10% vegetables							
10% fruit							
15% veg. and fruit							
20% veg. and fruit							
Hepoo cakes							
Eggs							
Milk, skimmed							
Cream, 16%							
Butter or oil							
Bacon							
Meat							
Fish							
			Total grams.....				

Food value of the diet: Calories.
Grams COH at 4 equals----------
Grams prot. at 4 equals----------
Grams fat at 9 equals----------
Total----------

Convulsions: If a patient is seriously overdosed he becomes unconscious.

The treatment of overdosage consists of immediately giving the patient food rich in sugar formers. We instruct our patients to have on hand a supply of little squares of Baker's sweet chocolate, and the nurse keeps oranges available, because orange juice is an excellent remedy and quickly relieves the milder symptoms. When the symptoms are more urgent, adrenalin may be administered hypodermically and will cause the body to rapidly change large quantities of glycogen into sugar.

In the severer forms of overdosage, where unconsciousness occurs and the patient can not swallow, glucose should be given intravenously at once. It is well to have available for administration 100 c. c. of sterilized 50 per cent glucose and a 25 c. c. syringe ready for instant use. Insulin should always be administered just before meals so that the sugar formers of the food may neutralize the insulin and the danger of overdosage diminished.

With an intelligent regard for scientific dietetics and a properly standardized preparation of insulin, one need not experience concern when the patient presents symptoms of hypoglycemia. It not infrequently occurs that patients are glad to indulge themselves in a candy spree after possibly years of abstinence. It is the old story of the snake bite sufficiently up to date to meet the requirements of the eighteenth amendment.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Since the publication of Banting and his associates of the first reports of the clinical effects of insulin in diabetes mellitus a sufficient number of cases have been observed throughout the world to justify the statement that when insulin is administered subcutaneously in adequate dosage it is capable, in a remarkably short time, of removing the cardinal symptoms of the disease for a period of several hours (approximately 10 or 12). To suppress the symptoms permanently, however, the injection must be repeated at least twice a day. So long as administration is continued the patient is able to assimilate much more carbohydrate than previously, and he begins to gain weight, and with it both physical and mental vigor. The blood sugar is lowered and maintained at a normal level; ketones disappear from the blood and urine. Craving for food disappears, and nervous and mental symptoms are abated or abolished; whether the diabetic condition is in any way cured by the rest which is given to the damaged pancreatic function by insulin can not as yet be stated.

One of our cases of severe diabetes, which during the early treatment required 20 units of H10 insulin, has advanced in such a satisfactory manner that for a period of five weeks insulin was not needed. Authorities agree that the best results have been obtained in the adolescent forms of the disease, but there can be no doubt that when insulin comes more into general use its administration, along with intelligent control of the diet, will have the same beneficial results in all serious forms of the disease. In cases of threatened coma its value is undoubted, and this is also the case in which it is used as a precautionary measure against postoperative risk in surgical procedure.

In a paper read before this conference several months ago entitled "Advances made in our professional work during the past year" it was stated that one of the objects of the hospital should be to make it possible for naval medical officers ashore and afloat in this vicinity to keep in touch with the latest diagnostic and therapeutic procedures. Thus, from time to time the commanding officer has invited eminent civilian physicians to give talks on timely subjects to the Army and Navy medical officers and the civilian physicians of San Diego.

In March Dr. Bernard Smith, of Los Angeles, a pioneer worker with insulin, delivered at this hospital a lecture detailing his clinical and laboratory experiences. We had already accomplished considerable work in blood chemistry and had developed an intelligent understanding of its possibilities. We had also made an intensive study of the relation of chronic foci of infection to systemic manifestations, and some of our investigations in this particular field were original and have been reported before the conference. Thus with the arrival of the first shipment of iletin in April from Lilly & Co. we were prepared to go ahead, and it would seem that we have considerable reason for gratification in being able to report this series of 12 cases of diabetes mellitus treated with insulin.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

NOVOCAINE ANESTHESIA.

By G. F. Cottle, Lieutenant Commander, Medical Corps, United States Navy.

The history of the development of the art of surgery during the past half century is inextricably bound up with the history of the development of the use of anesthetics. The aseptic era made modern surgery possible, but anesthesia made people willing to submit to operations. The type of anesthetic available greatly influenced the type of surgery performed. It often influenced the method of surgical attack and not infrequently the anesthesia used determined the final result. Before the days of ether, when partial anesthesia with large doses of alcohol and morphine was used, great speed was of vital importance in surgery to lesson the duration of pain which reflexly brought on shock. Often gentleness in handling tissues was subordinated to the vital requirement of speed. Ether and chloroform with their abolition of consciousness and of pain were accepted at first as the final solution of the problem and surgery took great strides ahead. More complicated procedures became possible and more persons were willing to submit to them. As experience grew, the dangers of these drugs became known. Chloroform, except in a few special localities, was practically discarded. The method of ether administration became modified; less was given and a less deep degree of narcosis maintained. It was found that the general anesthesia which lasted more than an hour was fraught with danger to life; that for the debilitated, the aged, and the very sick even less than one hour was often very dangerous to life. Gas and ether became the vogue; gas-oxygen and ether came to be used in sequence and in combination. Ether with scopolamine, morphine, atrophine, and other drugs was used. Ether with magnesium sulphate per rectum and many other combinations of drugs were tried and thought to be better and safer than straight ether. Ether vapor was warmed by complicated apparatus; it was given through tubes in the mouth, the nose, the pharynx, and the trachea. It was placed in fluid form in the rectum. Specially trained experts, men and women, made the administration of these drugs their life work, and the professional anesthetist came into vogue. State laws prohibited any but licensed physicians from giving general anesthetics.

The Mayos advocated the open-cone method of ether by the drop method. Crile developed his theory of anoci association with its combination of peripheral nerve block and gas-oxygen-ether analgesia. Patients still died occasionally of the immediate effects and not infrequently postoperative recovery was jeopardized by the after effects. The aged, the renal, the cardiac, the seriously anemic, the goitrous, and the debilitated were still bad anesthesia risks. Surgeons still found speedy operations necessary and often insisted on most complicated methods of anesthesia administration. Trans-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

fusion before operations, less strenuous methods of anteoperative preparation, a carefully developed technique to lessen anteoperative psychic apprehension, the use of alkaline and glucose rectal and subcutaneous solutions to combat acidosis and renal stasis, all these have had their advocates and have taken their place permanently as adjuncts to surgery and partial antidotes to the dangers of anesthesia.

If a study is made of the use of anesthetics at that great surgical center, the Mayo Clinic, the chapters in the history of modern anesthesia are illustrated by the varying practice of the staff at the present time. The oldest group of surgeons feel that a highly trained anesthetist, preferably a nurse, administering ether by the open-cone method is best and will suffice for any surgical procedure, even for exopthalmic goiter. The next younger group of surgeons favor gas-oxygen-ether administered by a highly trained expert. The next younger surgeons occasionally use and often speak of the advantages of spinal, caudal, paravertebral, block, and infiltration local anesthesia for certain procedures, as, for instance, the Kraske excision of the rectum, prolonged bone graft operations, the long dissections for the repair of ventral hernia, thyroidectomy for exopthalmic goiter, and they use the specialist in local anesthesia, who injects the novocaine solution for them prior to operation. The youngest group of surgeons use the specialist in novocaine more frequently and themselves use the block and infiltration methods of local anesthesia as part of their own surgical procedure, especially in exopthalmic goiter, the cachexia and starvation of cancer, the debility of gastric retention, and the dangers of thorocotomy and thoracoplasty. If we look elsewhere, we find Shields, of New Orleans, and Farr, of Minneapolis, using local anesthesia for almost every operation of general surgery. In Vienna and in France we hear of total and partial gastrectomy being performed with local anesthesia alone.

Aboard ship, in the field with the regiments of the United States marine forces and at naval stations, operations are of necessity performed occasionally and not as a rule every day or even every week. The occasional operator must work with an ever-changing crew. The flow of personnel in the service is so rapid and the changes so unavoidable that the naval surgeon is often forced to perform his surgical operations with a different team of assistants at each operation. Not infrequently must he operate with assistants of unknown ability and at times with assistants inexperienced in any but the rudiments of the surgical art. Seldom does he have the services of a trained and experienced anesthetist, and not infrequently he must use an anesthetist of unknown ability or one with insufficient experience. Often the naval surgeon must not only perform the operation but closely supervise or perhaps direct the administration of the anesthetic as well.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Local anesthesia does away with the dangers of this situation. In the naval hospital, aboard hospital ships, and at certain naval stations operations are performed at more frequent intervals, and there is a more permanent staff. However, even in these larger centers of naval medical activity, doctors come and go, nurses are of necessity moved to other duties than those of operating room, hospital corpsmen must rotate frequently in their duties to speed up their training. Change, change, change of personnel is a rule of the service that can not be altered because of conditions peculiar to and inherent in it. Even in that fortunate naval hospital where the services of a highly trained and capable anesthetist are available, unavoidable occurrences interfere with continuity of this service. An emergency operation or a case especially in need of the services of the trained anesthetist comes along and for one reason or another the surgeon finds it impossible to avoid using an anesthetist of unknown ability, thus adding to the complexity of his work and adding perhaps occasionally to the risk the patient must take. Local novocaine anesthesia simplifies this situation, and while it does not do away with the need for the well-trained anesthetist for those cases in which general anesthesia is required, it does make it easier for the surgeon to bridge over deficiencies in this staff which so often unavoidably occur.

For years in the active service afloat and in the field, the open-cone and the drop method of ether administration has been the usual, the favorite, almost the standard procedure. For many reasons, in spite of the difficulties caused by ever-changing personnel, this method has proven successful. The majority of persons in the active service operated upon outside the naval hospital or hospital ship are young and often unusually robust individuals with a large reserve of physical energy; seldom do they come to the surgeon debilitated by disease. The open-cone method is safe for these patients with ordinary care in administration. It requires the simplest apparatus, everywhere available, and this method of administration of ether can be supervised by the surgeon while he is operating. It is perhaps the safest method of general anesthesia in the hands of the comparatively inexperienced. In naval hospitals and on hospital ships, efforts to have on hand the more complicated forms of apparatus for general anesthesia have been successful, but years of effort have not succeeded in assuring the naval surgeon of the continuous presence of a specially trained anesthetist at all hours and every day in the year to aid him in his work. Local anesthesia will lessen the responsibility of the surgeon, who must otherwise not infrequently, because of these service conditions, not only operate upon his patient, but almost give the anesthetic in addition. Local anesthesia will permit the naval surgeon to shorten the duration of ether narcosis in debilitated subjects or when performing operations that can not be done in a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

comparatively short time, for it enables the surgeon to begin and end an operation without ether, thus greatly reducing the time of narcosis and greatly reducing the anesthetic risk to the patient.

The surgeon who wishes to succeed in the use of local anesthesia in general surgery must take care to estimate prior to operation each patient's psychic state and must be able to instill each patient with confidence in his ability to operate in this manner without giving him too heavy a burden of pain. He must acquire a knowledge of the surgical topography of the peripheral nerves. He must learn to cut and not to tear the tissues. He and his assistants must be gentle in handling tissues, especially so in traction. To these, add a quiet operating room, any standard book on the subject of local anesthesia (Lebat or Farr), sharp needles and knives, patience, persistence, and the opportunity to practice the method and success will attend the surgeon's effort.

At the naval hospital, New York, during the past three years, novocaine anesthesia has been used in an increasing proportion of cases operated upon. Its use has been extended from month to month to a greater variety of procedures. Patients in the surgical wards now seldom insist on ether before an operation and almost without exception after an operation are enthusiastic about local anesthesia. Those who at some former operation have had ether occasionally have to be won over to local anesthesia, but these patients are loud in their praise after operations under local. That limitations exist beyond which general anesthesia is necessary, is certainly true. Increasing experience, however, make these limitations less and less. That local anesthesia has proven its worth at this hospital is indicated by the fact that it has lived beyond the days of the pioneers here and has become the accepted routine practice to be given up for other anesthetics only when contraindications to its use exist. Somewhere between the ultraenthusiasts who feel that all surgery should be done under local and those ultraconservatists who condemn the method before sufficient experience has shown them its advantages, there is a middle ground upon which the seed sown by its early advocates will surely take root and grow as a great aid to surgery and a boon to surgical patients. In the United States Naval Medical Bulletin for June, 1923, King describes in detail many of the outstanding features of the technique of local anesthesia. It was his enthusiasm for this method coupled with his gentle and anatomically careful surgical technique that wore away the ether habit at the United States naval hospital, New York, and established the novocaine anesthesia as the usual preferred method. All credit for its development and establishment there belongs to him and to the support and encouragement given him by his chief of service, Commander Old.

During the six months' period, April to September, 1923, inclusive, the surgical staff of the United States naval hospital, New York has

Digitized by Google Original from UNIVERSITY OF MICHIGAN

performed 173 major operations, of which 99 were performed under novocaine anesthesia, 23 under combined anesthesia; i. e, novocaine plus general anesthesia. The remaining 51 were done under general anesthesia alone. Except for one death from cachexia and exhaustion on the 12th day postoperative of a case of advanced retroperitoneal endotheliomia all the operations have resulted in cure or sufficient improvement to warrant discharge from the hospital. It is the belief of the surgical staff that local anesthesia contributed materially to the sucess attending these operations and that it materially reduced the risk to life. In these 99 cases in which local anesthesia was used and in the 23 in which it was used in combination with ether or gas-oxygen-ether wound healing was not delayed. Not one serious infection occurred, though there were a few stitch abscesses, but not in a greater number of cases than occurred with straight ether. No evidence of toxicity from the drug injected was noted. The patient's anteoperative apprehension except in a few highly neurotic individuals was lessened. They advised fellow patients to ask for local. Postoperative care was much lightened for attendants and nurses, convalescence was quieter and happier; postoperative catheterizations less frequent, postoperative gas pains less severe, postoperative vomiting eliminated, and thirst not present.

It may not be out of place to define here briefly the terms frequently used to describe the type of local anesthesia administered:

Spinal.—Injection of the anesthetic solution into the space between the spinal cord and its sheath, the space bathed by cerebrospinal fluid. All sensory impressions of pain which emanate from the periphery supplied by nerves given off at or below the level of injection, generally the third or fourth lumbar interspace, are thereby blocked.

Caudal.—Injection of the anesthetic fluid through the hiatus sacralis on the posterior surface of the sacrum a little above the sacro-coccygeal articulation. The fluid bathes in this situation that leash of nerves called the cauda equina, thus blocking sensory impressions of pain ordinarily received from their peripheral distribution.

Para Vertebral.—Injection of the anesthetic solution into or around the spinal nerve at its emergence from the intervertebral foramen.

Peripheral Nerve Block.—Injection into the sheath or in the tissues immediately around the sheath of a peripheral nerve somewhere between its origin and the periphery.

Infiltration.—Injection into the tissues and generally means injection into skin, subcutaneous tissues and deep fascia, muscles, nerves, etc., at or around the immediate site of operation.

Intradermal Wheal.—Produced by injection between the deep and superficial layers of the epidermis.

The solution used is procaine 1 per cent in normal saline freshly made each day, sterilized by boiling and autoclave, four drops of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

adrenalin being added to each ounce just before use. The spinal and the caudal injections used are those described in Labat's book on local anesthesia, and these methods are used only when definitely indicated, because there are at times unpleasant reactions not seen in the usual infiltration procedure. The needles and syringes used are those listed on the Naval Medical Supply Table.

A little patience, a little care in relearning the surgical topography of peripheral nerves, gentleness in handling tissues, anatomically guided dissections with cutting, not tearing, a willingness to study the nervous and psychic state of each patient prior to operation, these combined with an opportunity to practice this method of anesthesia will, if persisted in, after the first few partial failures, make an enthusiast of any surgeon and will greatly minimize the patient's anteoperative apprehension and postoperative discomforts and will lessen the dangers of surgery.

The naval surgeon who becomes an enthusiastic and reasonably capable practitioner of this not difficult art will find it a boon to his patients and a great aid to his surgical success.

Table of illustrative cases.

Case No.	Initials.	Condition and operation.	Type of anesthesia.	Indications for local.
1	J. J.....	Cancer of lip and varix of leg, Mayo operation.	Local.....	Age 69, oral sepsis, debility.
2	K. A. J...	Incarcerated scrotal hernia.....	...do.....	Age 75, chronic alcoholism.
3	B.....	Senile gangrene, postamputation thigh.	Spinal.....	Age 81, advanced arteriosclerosis, oral sepsis, and senile emaciation.
4	F. E.....	Subphrenic abscess, first stage, rib resection.	Local.....	Chronic sepsis, emaciation, anaemia, 40 pounds below normal weight.
5	W.....	Rib resection.....	...do.....	Active pulmonary T. B. C.; chronic sepsis, pyopneumothorax, weight 98 pounds.
6	S. E.....	Rib resection, 6 ribs, second stage of graded thorocoplasty.	...do.....	Quiescent pulmonary T. B. C.; old empyema, tuberculous.
7	D. R. A...	Resection of ribs.....	...do.....	Recurrent old war-time empyema, acutely ill, chronic sepsis.
8	A.....	Excision of duodenal ulcer.....	Local and ether.	Chronic pulmonary T. B. C., underweight, undernourished.
9	R. A. J....	Chronic appendicitis.....	Local.....	Arrested pulmonary T. B. C., underweight.
10	G. E. F...	Fistula in ano.....	Caudal....	Arrested pulmonary T. B. C.
11	D.....	Block dissection, neck.....	...do.....	Tuberculosis of lymph nodes, old sinuses and fibrosis, prolonged dissection.
12	McL.....	do.....	...do.....	Do.
13	W. G. V..	Cystoma, neck.....	...do.....	Aid to dissection.
14	R.....	Thyroglossal cyst.....	...do.....	Do.
15	C. E. W...	Excision teno synovitis, wrist and loose fragment old commuted fracture, scaphoid.	...do.....	X-ray evidence fibrotic changes, both apices.
16	B.....	Hallux valgus, bilateral.....	...do.....	No after effects of ether necessary.
17	L.....	General peritonitis, acute gangrenous appendicitis.	...do.....	Acute illness.
18	A. L. J....	Nephrolithiasis ureterolithotomy.	Local and ether.	Acute illness, high fever, 30 pounds underweight, acute hydronephrosis.
19	Von S.....	Foreign body near lesser trochanter of femur.	Local.....	Prolonged dissection.
20	A. W.....	Recurrent inguinal hernia, inguinal hernia.	...do.....	Long dissection.
21	F. C. F....	Recurrent inguinal hernia following infection.	...do.....	Do.
22	McD.....	Ventral hernia.....	...do.....	Do.
23	O'B.....	Femoral hernia.....	...do.....	Poor physique, underweight.

NOTE.—This group of 23 cases selected from the 173 major operations performed at the United States Naval Hospital, New York, N. Y., during the six months' period April to September, inclusive, illustrates the range of surgical procedures carried out under local or combined anesthesia. Of the 23, 1 was spinal, 1 caudal, 2 combined local and ether, and 19 local. Of the entire 173, 96 were local, 1 spinal, 2 caudal, 23 combined anesthesias, and 51 general. Under the heading "Indications for local" are given some of the reasons local was considered indicated in these cases. For the two combined anesthesias in this table, ether was used after the incisions were completed because of the special need for retraction.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

OBSERVATIONS CONCERNING YAWS IN HAITI.

By P. W. Wilson, Lieutenant, Medical Corps, United States Navy.

This paper is not in any sense an exhaustive study of yaws, nor is any attempt made to draw any conclusions concerning the relationship between yaws and syphilis. There is no doubt that both diseases exist here in abundance, and the excellent opportunity offered for the study of the two in parallel should stimulate further research. Our own brother medical officers in Guam and Samoa have contributed considerable information, and they are quoted in nearly every article on the subject, but no one has yet proved conclusively whether *Treponema pallidum* and *Treponema pertenue* are the same organism or not. It has been, and is still, held by some distinguished authorities that yaws is syphilis modified by race and climate. From Manson's Tropical Diseases, 1921, the following quotations may not be out of place: "Yaws is practically confined to the Tropics and sub-Tropics and even there is absent at high altitudes, but owing to its great similarity to syphilis, and the extent to which these two diseases overlap, it would appear to be impossible to define its exact limits. Probably some reciprocal immunity between the two diseases exists, for wherever yaws is widespread—as, for instance, in the Pacific Islands—there syphilis appears to be unknown." "Opinions differ with regard to the exact morphology of *T. pertenue*, but later observers, including Dobell, have been unable to distinguish any structural differences between this treponema and treponema pallidum of syphilis." "The disease was originally reproduced in the big apes in Sumatra by Neisser, Baermann, and Halberstadter, who found no reciprocal immunity in these animals when subsequently infected with syphilis; but this view is opposed to the work of Lavaditi and Nattan Larier."

It is interesting to refer briefly to the early history of yaws and syphilis. Diaz de Isla, a Spanish physician of some note practicing in Lisbon, in his book written between 1510 and 1520, states that syphilis was unknown in Europe before 1493 and that, as far as Europe was concerned, it had not made its appearance until Columbus's crew brought it to them from the Isle of Espanola. He also states that the majority of Columbus's crew returned to Spain infected with the disease, which they had acquired in Haiti, and that he himself treated several of the syphilitic sailors, including the pilot, Pinzon de Palos, and that after the arrival of Columbus in Barcelona in 1493, syphilis spread among the inhabitants. His statements are confirmed by Olviedo and Las Casas, both of whom visited the New World a few years later. Olviedo, in a report to Emperor Charles V, states that it is certain that syphilis originated in the West Indies, but was a milder type than in Europe. Concerning the history of yaws Manson states that it seems probable that yaws

Digitized by Google Original from UNIVERSITY OF MICHIGAN

was originally an African disease and, so far as America and the West Indies are concerned, that it was introduced by negro slaves. In the days of West Indian slavery the specific and infectious nature of yaws was thoroughly recognized, and the planters controlled it by instituting yaws houses and similar measures, but since the emancipation of the negro the disease has again become very prevalent. In tropical Africa, particularly on the west coast, yaws is very common.

The original Indian inhabitants practically disappeared fram Haiti toward the close of the sixteenth century or within 100 years after the first coming of the white man. About 1505 the first negro slaves were imported into the island where they increased at their usual rate and their numbers were further augmented by large importations from the west coast of Africa until within a century after the arrival of the first negro they had practically replaced the native population. One of the earliest writers concerning the West India Islands, in speaking of the malignant fevers, says: "The bad air was brought there by some ships which came from the west coast of Africa." History tells us in a rather indefinite way that the native Indians were unable to stand the hard work imposed upon them by their Spanish masters. But right here it is interesting to ask ourselves some questions. Was the Indian killed off by cruelty of the Spaniards or by yellow fever from Africa? Why did the negro thrive so well in contact with the syphilitic Indian? Was he wholly or partially immunized to syphilis by yaws? It is impossible to answer these questions conclusively, but it is believed that Haiti was the first country where the two diseases were present at the same time.

One frequently hears the remark from both laymen and physicians that 80 per cent of all Haitiens are syphilitic. Lieutenant Choisser obtained 71.2 per cent positive Wassermanns on patients admitted to the Haitian General Hospital, and while these findings are exceptionally high yet no one can say what proportion of that number were syphilitic and what proportion had had yaws.

The writer has only seen 19 cases of yaws in the secondary stage during nine months residence in Haiti, but the number of cases seen in the tertiary stage is well over 200. The doubt will be immediately raised as to whether a good proportion of such a large number of tertiary lesions were not luetic instead of grambesial, and in answer to the supporters of the luetic diagnosis the balance of this paper is devoted.

For all Haitians, regardless of degree of color, intelligence, or social position, "pian," or yaws, is a disease of shame. Don't ask a Haitian, "Have you ever had yaws?" Ask him, "How old were you when you had yaws?" If he comes from the country, keep insisting, and if there are no bystanders listening he will probably

Digitized by Google Original from UNIVERSITY OF MICHIGAN

admit the disgraceful fact, or he will reply that he has not yet had it. Why is there such an opprobrium attached to this disease? Does it date back to the time of the yaws houses where the unfortunate sufferer was isolated as a leper and where he spent many long months in company with other outcasts from society? At any rate the readiness with which a patient admits a past yaws infection seems to vary greatly in different parts of the country. At Aux Cayes, for example, it is understood that it is almost impossible to get an affirmative answer.

The disease in the secondary stage is practically unknown inside the city limits of Jacmel, and for a good reason. Since early times no cases have been allowed to remain in town once they have been discovered. Only two cases in the secondary stage have been seen in the outpatient clinic. One was a young adult on his way out of the city and he only stopped at the hospital because it was on his road. He had been told by several citizens not to remain in town overnight or he would be driven out if he was discovered the following morning. The other case was a little girl whose lesions were mostly hidden by her clothing, and she escaped unnoticed. Inquiry has been made from several of the older inhabitants and they all substantiate the story of the fugitive, "No early yaws cases are ever allowed to remain in the city." Many of the tertiary cases come to the city and are allowed to remain, for it is the popular opinion that such people are either lepers or syphilitics, and as such they are considered harmless.

What happens to the primary or secondary case in the country? Often he is put in a house apart from the rest of the family and he is so ashamed of his condition that he keeps himself hidden without persuasion. If you meet him on an out-of-the-way trail he will either move quickly into the nearest cover of underbrush, which is usually close at hand, or he will so wear his hat or hide his lesion with his hand or arm that you will not see his condition. This is not only true when he passes a white man but he acts the same in passing any stranger.

What treatment do such people employ? First of all, they must not get well too quickly, for it is generally accepted that a quick disappearance of the lesions can mean only one of two things—a quick death or some "inward disease" more difficult to cure than the yaws. The question has been frequently asked in different sections of the district concerning the treatment employed, and the answer is always the same. "Daily baths in clear, cold water." These patients never seek medical assistance. Seventeen cases have been personally invited to come to the hospital for treatment, and it has also been carefully explained that by early treatment they could avoid the "crab," or foot yaws, the disfiguring mutilation of the nose

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and face, the painful leg ulcers and bone deformities. They always say, "Yes; I will come," but none of them have arrived.

Of the more than 200 cases of tertiary lesions seen at the Jacmel Hospital every one coming from the country districts has given a history of yaws. Most of the adults state they had the yaws when they were children and that their present trouble is due to "a fall from a horse," "an attack of cholerine," "that it followed immediately after the smallpox," or "that some enemy has placed a curse on them." The last explanation is probably the most common. It is practically impossible to convince any of them that their condition is a result of yaws. They say that they have already had yaws, which never comes a second time. In only one case was a history of both yaws and syphilis obtained, and this patient stated that his yaws was contracted in town; that he was forced to go to the mountains on account of it, and he remained there four months. Shortly after his return he contracted what was called a chancre and he now has a perforation of the hard and soft palate. The diagnosis of either condition in this patient may have been incorrect. Certainly he has had one or the other of the two diseases, but to say that he had both may be readily doubted.

It is impossible to give an estimate of the amount of syphilis present in the Jacmel district. It is believed, however, that while yaws is essentially a rural disease, syphilis, though it is not confined to the towns, yet certainly it is more generally found in the city and villages. Only one case of undoubted syphilis with primary and secondary lesions has been seen in a patient living and working in the country; he denied yaws and stated he obtained his infection in town. Five cases of aortitis have been diagnosed, all of whom were city dwellers, four of whom admitted syphilis, and they all denied yaws. Three cases of hemiplegia occurring in young adults have been seen, one of whom admitted syphilis and lived in town; the other two were from the country and both admitted yaws and denied chancre. The writer is not qualified to diagnose border-line cases of iritis, but up to date no typical cases have been seen in patients admitting yaws. The teeth of nearly every patient coming into the out-patient clinic have been examined for evidences of hereditary syphilis, but no suspicious or characteristic syphilitic teeth have as yet been recognized. It has been observed that syphilis is more prevalent among the mulattoes than those nearly or entirely black. Two factors may explain this—mulattoes are generally considered to be cleaner in their personal habits than the blacks and perhaps for that reason have not contracted yaws which might immunize them against syphilis; and the proportion of mulattoes is greater in the city, where they are more exposed to syphilis than in the country.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Of the tertiary yaws lesions most frequently seen, those resembling tubercular syphilides with ulceration are by far the most common. Periostitis and osteitis of the bones of the leg with ulcerations of the skin are the next in order of frequency. Destruction of the bones of the nose and posterior portion of the hard palate are the next in order, and where the nose itself has disappeared the patient usually gives a history of the infection having progressed into the nares from skin lesions on the face, and the abundant scarring of the face substantiated such a history. In this connection Kerr urges the disuse of the term "gangosa," and to place the ulcerations which the term was employed to describe into the category of late syphilis or late yaws.

Twelve cases of saber-shaped tibia have been observed, each one of whom gave a history of yaws occurring prior to the leg pains and later deformity. The clavicle, scapula, radius, ulna, and small bones of the hand and foot are not infrequently involved. One case of epiphysitis of the knee joint, unilateral, has been seen, and this was the only case where the femur seemed to be involved. The humerus also seems to be exempt, and the same may be said of the ribs and vertebræ, but in this connection one case of what appeared to be spondylitis reacted so well to one treatment of neo-salvarsan that he insisted he was entirely well and refused to wait further treatment and study. It is reported that "crab," or foot yaws, is very common, but it occurs during the secondary stage or very soon afterwards; the natives recognize it as being of yaws origin and for that reason they do not come in for treatment. But one case has been seen in the out-patient clinic, and she came 5 miles over the mountains for "chills and fever," and the "crab" was found when an inquiry was made into the cause of her limping walk. She strenuously denied that it was the "crab" until she saw that we were too positive in our attitude to be dissuaded, but she stubbornly refused to receive treatment for it, stating that she only wanted treatment for her fever. One of the principal difficulties encountered in treating tertiary cases is the inability to keep patients long enough or have them return for treatment after they have once left the hospital; they feel so much better after one dose of salvarsan that they leave in spite of advice to the contrary, and will return again after 9 or 10 months have elapsed when they have another exacerbation. It would appear that not less than three salvarsans at weekly intervals should be given all tertiary cases; and, on the other hand, it would appear that there is but little clinical improvement after the fourth injection has been given. This lack of response beyond a certain stage of improvement is probably due to blocking of the circulation by cicatricial contraction and new bone formation, to malnutrition or secondary infection, and usually all three of these conditions exist.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The epidemiology of the disease will not be discussed but it is desired to call attention to one fact: The Haitian countryman hardly ever uses soap in bathing his body, and in place of soap he uses leaves or grass for a wash rag. The mulatto needs to use soap in order to see the real color of his skin, but the black man's skin tells him but little no matter how thoroughly he may scrub himself. In this connection we only need to remember that soap solution is one of the best prophylactic agents against infection by the treponema pallidum. In view of such close resemblance to treponema pertenue in morphological and cultural characteristics and the clinical tertiary manifestations in the bones and skin, may we not assume soap to be equally effective against both organisms?

To give even an approximate estimate of the amount of secondary, tertiary, and latent yaws in the district of Jacmel is, of course, impossible, but several of the more intelligent residents who have been familiar with rural conditions for a long period have been questioned, and their replies may be worth considering. The lowest estimate of the number of cases of primary and secondary yaws now existing in the Jacmel district was 1 per cent of the rural population, while the highest estimate was 18 per cent; for those who have had yaws the lowest estimate was 25 per cent, and the highest was 80 per cent.

Some suggestions concerning methods of combating this malady may not be out of place here. The present custom of waiting for the case in its most infectious stage to come to the hospital for treatment is accomplishing nothing. The lack of money, and indirectly, the insufficient supply of neosalvarsan together with the limited bed capacity of our hospitals does not give us the means to care adequately for the tertiary cases who always require more treatment and hospitalization than an early one. Mercury is slow; it is difficult for patients to come from a distance for repeated injections; cases of stomatitis following mercury are frequent, and when they occur, tend to discourage not only the patient himself but any others who may learn of his condition. This tendency to stomatitis may be attributed to bad teeth and the almost universal habit of eating some acid fruit nearly every day. It is suggested that here is an abundant field to give sulpharsphenamine a good trial. It is difficult to give neosalvarsan under conditions existing in the country. Most of the early secondary cases are in children, and a relatively painless subcutaneous or intramuscular method of administering arsenicals of sufficient therapeutic efficacy would be most welcome to patients and public health officers alike, and it would greatly simplify work done in the field. Voegtlin, Johnson, and Dyer, of the United States Public Health Service, in their experimental work on sulpharsphenamine have found that it is as well tolerated when injected intravenously as is arsphenamine; that intramuscular injections of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

concentrated solutions cause some local reaction, which is, however, much less severe than that following similar injections of arsphenamine or neoarsphenamine; that it can be injected subcutaneously with impunity, provided that for full therapeutic doses the concentration is kept high (20 to 30 per cent); that aqueous solutions of sulpharsphenamine are very stable, which is in striking contrast to solutions of neoarsphenamine; that the toxicity and parasiticidal value of sulpharsphenamine shows that the chemotherapeutic index, or margin of safety, is at least as good as that of the most potent drug so far known, namely arsphenamine.

In conclusion it is considered:

1. That syphilis is more prevalent in the towns than in the country districts.

2. That yaws is very prevalent in all rural sections of the district of Jacmel.

3. That yaws is the most frequent cause of crippling and facial mutilation, and, as such, it is a constant economic drain on the Government.

4. That any campaign against yaws involves the curing of the early cases during the infectious stage, which means that at first the treatment must be taken to the patient rather than waiting for him to come to the hospital or dispensary.

5. That in order to facilitate such field work sulpharsphenamine should be given a thorough trial, with the hope that it will prove to be a remedy that can be given quickly and easily in the field.

THE RELATION OF THE CLINICAL LABORATORY TO THE MODERN HOSPITAL.

By H. S. SUMERLIN, Lieutenant, Medical Corps, United States Navy.

Progressive development of laboratory methods for the study and diagnosis of disease has resulted in an increasing demand for accurate and reliable bacteriologic, serologic, pathologic, and chemical examinations, and for the preparation of biologic products as diagnostic aids and therapeutic measures. The past few years have seen a rapid multiplication of clinical laboratories particularly in connection with hospitals.

Due to the financial saving, a large number of institutions depend almost entirely on technicians for the conduct of their laboratories, with little or no supervision, a condition which can do nothing but lower the standing of the clinical laboratory. A course in medicine is not necessary in preparation for the technical side of the work; however, for the interpretation of laboratory findings, especially serology and tissue pathology, a medical education is essential. To be of the highest service to the hospital, the laboratory must be in

Digitized by Google Original from UNIVERSITY OF MICHIGAN

close cooperation with all of the other lines of medical work done in the institution. This demands that a physician be in charge of it, and that he be a consultant of the clinician to interpret the significance of laboratory finding and to suggest additional laboratory procedures. Furthermore, his relation to the laboratory should be more than supervisory, he should devote his entire time to it. Problems are constantly arising in connection with the routine work which the technicians are unable to solve. The laboratory chief should be present in order that these problems may be referred to him.

The efficiency of the laboratory is dependent also in no small degree upon the caliber of the technicians, as a large volume of the routine work is performed by them. Technicians must be taught the absolute necessity of honesty in reporting findings. I have known a technician to change the result of a blood count to conform with the patient's diagnosis, thinking he might have made a mistake.

The functions of the laboratory are as follows: First, to give what aid it can in solving the diagnostic problems confronting the physician; second, to aid in the prognosis of many cases, including the estimation of operative risk, by means of routine procedures, blood chemistry and basal metabolism determinations; third, by the same procedures, to show the effect of treatment; fourth, to detect unsuspected pathological conditions; fifth, to prepare biologic products such as autogenous vaccines and Swift-Ellis serum as therapeutic aids; sixth, to perform post-mortem examinations as a means of advancing our knowledge of disease and as a necessary step in cases where diagnosis is in doubt; seventh, to conduct original investigation and research.

A chemical and microscopic urinalysis on each patient admitted into the hospital should be routine. It may detect an unsuspected pathological condition or correct a mistake in diagnosis. Too often a chemical analysis is done and the microscopic omitted. It is not infrequent that the detection of blood cells in the urine will lead to a change of diagnosis from acute appendicitis to stone in the kidney or ureter. A blood Wassermann on each case admitted will disclose many cases of unsuspected syphilis, and the information gained is worth the extra work which this requires. A spinal fluid analysis on every case of syphilis is now a recognized procedure; this includes cell count, globulin, Wassermann, and colloidal gold. I do not believe that the Lange colloidal gold reaction gives any information when the other tests are negative, and it is our custom to do this test only on known syphilitic spinal fluids. The value of this test lies in its ability to differentiate between paretic and cerebrospinal types of syphilis.

A complete blood count on each case admitted is ideal, but when the facilities will not permit of this, I would omit routine blood counts.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Stitt (1) says regarding routine blood examination: "As a practical point, it is very rare that a red count is indicated. There is one point not sufficiently recognized by physicians, and that is that a routine blood examination is not apt to be as carefully conducted as one calling for a specific feature. Without disparaging the necessity of routine examinations of urine as well as blood, it is a fact that the internist who knows what he wants gets better results from the laboratory." I can see nothing to justify a routine white count on each case admitted; a routine red count or a routine hemoglobin estimation would be of just as little value. I would condemn the practice of making a red cell count alone; it gives no more information than a hemoglobin estimation alone, is more subject to error, and more time consuming. Either will indicate anemia; both are necessary in differentiating primary and secondary types.

In addition to the usual pathologic, bacteriologic, serologic, and chemical examinations, the clinical laboratory of the modern hospital must be prepared to do blood chemistry, basal metabolism estimations, immediate diagnosis of tissue by frozen sections, dark field microscopy, blood grouping for transfusion, and possibly skin sensitization tests.

Chemical examination of the blood gives practical information in nephritis and diabetes in which older methods of blood examination gave little information. Only by blood sugar determination is the differential diagnosis made between diabetes mellitus and renal diabetes. We have seen several officers who have been placed on the retired list as diabetics because sugar was found in the urine. These cases showed normal blood sugar both under fasting conditions and after a carbohydrate test meal. In diabetes mellitus the hyperglycemia is the condition to which the attention should be directed, the excretion of sugar by the kidney being simply one of the body's many factors of safety. An advanced case showing nephritic symptoms may show a large increase of sugar in the blood without its appearance in the urine. The importance of blood chemistry is seen in the fact that insulin, the pancreatic extract used in the treatment of diabetes, was first placed in the hands of those only who could carefully control its use by blood sugar determinations.

Estimation of the nonprotein-nitrogen content of the blood gives accurate information as to the permeability of the kidneys. Frontz and Geraghty (2) state that practically all the information of clinical value gained by the estimation of total nitrogen, nonprotein-nitrogen, uric acid, and creatinine is furnished by the estimation of the blood urea alone. The prognosis in a case of chronic nephritis is indicated by the blood creatinine, as figures over 3.5 mg. per 100 c. c. should be viewed with grave concern while anything over 5 mg. almost invariably indicates an early fatal termination. This does not hold

Digitized by Google Original from UNIVERSITY OF MICHIGAN

true in acute renal conditions such as acute nephritis, bichloride poisoning, or acute exacerbations of chronic renal disease. The blood urea nitrogen has been found to be a very valuable preoperative prognostic test in cases of prostatic obstruction. When the figures are between 25 and 30 mg. per 100 c. c. of blood, the patient should be operated on with caution, while anything over 30 mg. indicates a poor operative prognosis.

The dark-field microscope is one of the most valuable instruments we possess, for by its use a positive diagnosis of syphilis can be made in almost 100 per cent of cases when the primary lesion is seen early and before any antiseptic has been applied. Since the diagnosis is more or less uncertain when the lesion has been treated, the importance of a dark-field examination of every venereal sore before instituting treatment can not be overemphasized.

No laboratory is complete without facilities for the immediate diagnosis of fresh tissue. That the tissue pathologist is an essential factor in clinical diagnosis is shown by McCarthy and Broders (3), in whose series of mammary carcinomata the surgical pathologist discovered 22 per cent during operation which the clinician and surgeon had diagnosed benign or doubtful conditions. Harper (4) gives the result of two years work on tissue at the Naval Medical School as follows: Clinical diagnosis correct 57 per cent, incorrect 9 per cent, clinical diagnosis undetermined 34 per cent. The number of doubtful and undetermined diagnosis shows how much the surgeon and clinician depend upon the tissue pathologist.

One of the most recent additions to the field of the clinical laboratory is the determination of basal metabolism. Pickard (5) states that the determination of basal metabolism in thyroid disease is like the use of the thermometer in febrile diseases and answers the same purpose of diagnosis, measuring the severity and marking the course of the disease and the effect of treatment. He states that basal metabolism estimation should be made (1) in cases with goiter to ascertain possible toxicity, (2) in cases with or without goiter having symptoms of thyrotoxicosis, (3) in similar cases with symptoms of thyroid deficiency, (4) in cases of obesity to differentiate those due to thyroid and pituitary disease, (5) for an accurate measure of the effect of treatment of thyroid disease. This is a very valuable preoperative prognostic test. When the rate is high, rest, hot-water injections, or ligations are resorted to preliminary to thyroidectomy.

It must be the aim of the clinical laboratory to establish a reputation for accurate and reliable work in order that the clinician and surgeon may be able to place full confidence in every report they receive from it.

It is said that there is an increasing tendency, especially among the younger physicians, to lean more on laboratory and instrumental

Digitized by Google Original from UNIVERSITY OF MICHIGAN

aids than on strictly clinical methods of examination. It is also said that many men are accepting laboratory reports without fully appreciating the possibilities of error both in the tests themselves and in their interpretation at the bedside. In some cases, on the basis of history and examination alone, a certain diagnosis is impossible; in other cases, the laboratory reports are misleading; but as a general rule, the clinical laboratory is one leg upon which the diagnosis must rest. The other legs are the X-ray, the history obtained, and the physical findings.

REFERENCES.

1. Practical Bacteriology, Blood Work, and Animal Parasitology, fifth edition, p. 224.
2. Jour. Am. Med. Assn., Oct. 21, 1922.
3. Surgy. Gynec. and Obst., December, 1917.
4. U. S. Nav. Med. Bull., January, 1922.
5. Jour. Lab. and Clin. Med., August, 1922.

A GAS MASK FOR HEAD AND CHEST INJURY CASES.[1]

By F. F. Lane, Lieutenant, Medical Corps, United States Navy.

The objects to be accomplished by a mask suitable for such cases are as follows:

1. It must be an efficient substitute for the present mask, which could not be worn in such cases, but its protective qualities need not be of such a lasting nature.

2. It must be light, strong, and durable, to withstand folding, rolling, and field conditions.

3. It should be of one uniform size. As small and compact as possible when not in use but must fit the largest or smallest man. This would obviate the necessity of carrying several sizes and confusion in issue and application.

4. It should not disturb any first-aid dressings which would be applied on the field.

5. It should be easy to make replacements or carry spares. Easy to handle on the field, easy to put on an unconscious man who is on or off the stretcher.

6. The stretcher bearer should be able to observe the patient.

7. The patient should be able to wear it without removing while changing from stretcher to stretcher or stretcher to ambulance.

8. It should be easy and cheap to manufacture.

The mask.—This is to be hood or sack shaped, about 36 inches long and 60 inches in circumference at the open end. The closed or head end should be shaped in to fit the head and neck closely. The material to be of thin rubber and covered with nonelastic stockinette. This rubber and stockinette to be of the same specifications as the present gas mask but the rubber about one-fourth as thick.

[1] Reprinted from Chemical Warfare of Nov. 15, 1923.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

In the closed or head end will be the usual present-day nonshattering glass eyepiece with metal rings and fittings; a metal angle tube fitted with a gas-tight joint for connecting or disconnecting the corrugated tube, such as is used in the aviator's mask; the flutter valve and guard, but without the usual rubber or metal Y tube or air deflector.

The open end will have a 4-inch webbing belt, 50 inches long, fitted with a friction-lock metal buckle, similar to the present issue belt buckle. This belt to be sewed on the outside, about 1 inch above the bottom, for 15 inches on each side of the mid line of the back with the remaining 10 inches of each end of the belt to be loose in front. On the inside of the hood at the open end and centered beneath the webbing belt outside, will be a thin rubber tubular ring about 2 inches in diameter covered with elastic stockinette and fitted with a valve and mouthpiece for inflating by mouth.

Corrugated tube.—To be similar to the present tube, 18 inches long and with an air-tight joint connection for attaching to the face piece.

Canister.—To be of the same construction and to have the same contents as the present olive-drab or blue canister but about one-half as large, that is about 1½ by 2¼ by 4 inches.

The carriers.—1. Headpiece carrier: A flap of heavy canvas about 18 inches long and about 8 inches wide, firmly attached to bottom of the wooden side piece of the regular Army stretcher. One long edge should be firmly fixed to the bottom just inside the metal foot and the other fitted with snap buttons to fasten the upper edge of the side piece. The hood and corrugated tube may be folded, rolled up, and carried in this canvas tube, and easily removed. The corrugated tube to run from the canister around the metal foot of the stretcher into this roll.

2. The canister carrier: This is to be a heavy canvas pocket, into which the canister will just fit, fastened securely beneath the wooden side piece of the stretcher, just outside of the metal foot.

General discussion.—The gas mask just described appears to be one solution of the problem which will satisfactorily answer all the requirements set forth in the beginning of this paper. It should be easy to manufacture, since there are no new materials involved and many of the present stamps, dies, and molds may be used. The material described might be changed to some substitute for rubber when discovered or it would be much thinner and less bulky if made from rubber-coated cloth such as was used in the old issue black poncho or the very thin rubberized cloth of which the present-day housewife's apron is made, if these substitutes would give sufficient protection. The hood, if made of the present, but much thinner

Digitized by Google Original from UNIVERSITY OF MICHIGAN

material, would be strong and durable, easily folded, and rolled into a cylinder of about 2 inches in diameter, and it would have sufficient stiffness to allow it to be drawn over the head, shoulders, arms, chest, abdomen, and back down to the hips of an unconscious or semiconscious man without very great difficulty either on or off the stretcher.

The hood, with the wide webbing belt and inflated rubber ring, will be as gas-tight as is possible. In small men the excess material in front may be folded carefully so that the lower edge will be entirely included under the tightened belt. Whatever small openings are left due to the contour peculiarities of the individual and any opening left from time to time by abdominal breathing may be filled up by inflating the rubber ring. If this inflation is interfered with by the weight of the man lying on it, lifting the patient momentarily by the hips will obviate this difficulty.

It is made in one large size, so that it will fit any and every man as the stretcher bearers come to them on the field. The dimensions and sizes given are only approximate, so that statistics and practice may make a larger one necessary or a smaller one more feasible. It is made long to the hips in order not to interfere with abdominal or chest breathing or allow openings to occur with respiration. One objection to this large size on a small man would be the possibility that, due to the large cubical contents of the hood, the patient might breathe the air in the hood over and over again and not breathe through the canister. This could be eliminated by tucking the excess material under the patient's back or having several straps or elastic bands on the outside to take up this slack.

It is convenient and easy to carry, being fastened to the stretcher, and does not need to add to the individual load of the stretcher bearer. It will add, probably, only about 5 pounds to the weight of the stretcher. It does not need to be carried unless gas casualties are expected. Two outfits may be carried with each stretcher, one at the right hand side of each end when facing the center of the stretcher. This will add 10 pounds to the stretcher but allow for a spare canister and mask. It will allow the stretcher bearers to protect two men at once upon their arrival, leaving one behind on the field with the mask, tube, and canister, while the other is carried to the rear. Immediate protection would be given to two men instead of one. The detachable feature of the corrugated tube would allow either the canister or the mask to be canted or removed from the stretcher separately. The hood might be carried away from the stretcher to put on a patient under circumstances in which it would be impossible or inconvenient to do otherwise, or the man could be put in an ambulance with the mask on, with or without the canister.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The first-aid dressings could be put on before the mask is adjusted, and then the hood would not disarrange, rub, or wet them as would be the case in a hypohelmet or other such contrivance which depends upon solutions for its protective powers.

The only reason for the eyepieces is to afford a means for the stretcher bearer to observe the patient's condition. The material is thin enough to allow its manipulation to clear eyepieces of moisture or to lift the eyelids or open the mouth.

The canister is made small because, first, a long-continued or great amount of protection is not needed, since the patient is removed from the gas-infested area with as much speed as possible, and, secondly, it is more compact and easy to stow on a stretcher, being equal in width to the wooden side piece, and will be protected by the metal foot from injury and tearing off by brush.

A gas-mask outfit as described above would give efficient and complete protection to men with head, chest, or abdominal injuries and any combination of these three types of wounds complicated by gas, in which it would be impossible or inconvenient to use the usual face mask.

If difficulty was experienced with the canister or with the bellows action of the hood in respiration or if it was thought advisable because practically all cases would be gassed by lung irritants, the flutter valve, the inflated rubber ring, and the canister could be done away with and a small oxygen tank substituted for the canister. In this way the patient would begin breathing pure oxygen immediately and the increase of gas pressure within the mask would overcome the atmospheric pressure outside, allowing the contained gas to escape outside and establish a current of flow outward, thus effectually sealing off the hood from any entrance of poisonous gas.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

CLINICAL NOTES.

IMPROVED TECHNIQUE IN SPINAL PUNCTURE.

By T. W. Raison, Lieutenant Commander, Medical Corps, United States Navy.

Spinal puncture in many conditions is indispensable as a diagnostic measure. Using the ordinary technique the procedure frequently is followed by severe headache and prostration to such an extent that the patient is confined to bed from one to several days. Owing to the depth of the spinal canal, from 4 to 6 cm. from the surface, and the resistance of the tissues encountered, a needle of sufficient size and rigidity to obviate the danger of breakage must be employed. Under ordinary technique in making spinal puncture, the obturator is placed in the needle, and when the dura is encountered, owing to the size of the needle a tear is produced which remains open until healing takes place. MacRobert[1] asserts that sometimes the arachnoid is pulled through this opening as the needle is withdrawn, and that this causes a constant leakage of spinal fluid, which, by temporarily destroying the "hydraulic support" of the brain, is responsible for the headaches which so frequently follow lumbar puncture. With a punctured wound of the dura with a fine needle, trauma is greatly minimized.

In the technique of spinal puncture devised by Randal Hoyt, M. D., assistant attending physician, New York Skin and Cancer Hospital, a special needle is employed. This technique was first described in an article entitled "An apparatus for withdrawing spinal fluid without postpuncture reaction,"[2] but has since been modified by the improvement of the needle making the whole apparatus self-contained. The improved needle is manufactured by Becton, Dickinson & Co., Rutherford, N. J. The appliance consists of two needles, one slipping into the other. The outer needle is the ordinary type of lumbar puncture needle with a set-screw inserted in the shoulder to hold the inner needle so that its point is flush with the bevel of the outer needle during insertion. When the set-screw is loosened, the inner needle can be projected for about a quarter of an inch (6 mm.). The proximal end of the outer needle is arranged as a fitting for a Luer syringe, whereas the proximal end of the inner needle is arranged for a Record syringe.

After the apparatus is arranged for introduction, lumbar puncture is made in the usual way up to the point of piercing the dura. At

[1] MacRobert, R. G.: The cause of lumbar puncture headache. J. A. M. A., 70: 1350, May, 11, 1918.
[2] Hoyt, Randal. J. A. M. A., 78: 428, Feb. 11, 1922.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

this place there is a distinct feeling of resistance. When the sensation of resistance is encountered, the set-screw is loosened and the inner needle pushed forward as far as it will go, making a punctured wound in the dura. The obturator is withdrawn from the inner needle and a Record syringe attached and the spinal fluid withdrawn. If a spinal treatment is to be administered, this is injected by a second syringe. To remove the apparatus, the obturator is inserted in the inner needle, the inner needle drawn into the outer needle, and the whole apparatus withdrawn.

The common error is to carry the insertion of the outer needle too far and pierce the dura, thus performing an ordinary puncture. This can be obviated by stopping the insertion of the outer needle as soon as a feeling of firm resistance is encountered and projecting the inner needle, should spinal fluid not be obtained, the outer needle can then be shoved in as far as the slide and the inner needle again projected. The dura offers scarcely any appreciable resistance to the fine inner needle, and if firm resistance is encountered it is at once evident that technique is wrong and a bony wall encountered; the point of the inner needle would probably be broken if pressed with force against a bony wall. Should the inner needle strike a nerve root, it causes exquisite pain, therefore it should be inserted with great gentleness.

From the observation of a large number of patients, it would appear that postpuncture reactions are seldom encountered, bloody taps are obviated, and the entire procedure hardly more serious than an ordinary venous puncture. Patients are advised, however, to rest quietly for the remainder of the day following the puncture; hospitalization is unnecessary.

TRAUMATIC HEMATOMA OF SPERMATIC CORD.

By L. H. Williams, Lieutenant, Medical Corps, United States Navy.

The case reported herewith is interesting because of its origin and rarity, in addition to the confusion in diagnosis which was established only at time of operation.

The patient, a marine on active duty, was admitted to the hospital with diagnosis of strangulated hernia, left inguinal. He complained of pain and swelling in left inguinal region and stated that while wrestling some two hours previous to admission he felt a sudden acute, tearing pain in that region. Swelling was noticed at external ring almost immediately.

On admission an attempt was made to reduce the tumor by taxis. No impulse at external ring was made out on coughing. Temperature, pulse, and respiration were normal; and there was no evidence of shock, save paleness.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Immediate operation was decided upon because of the irreducible swelling and pain. Through the classical incision for hernia a greatly swollen and hemorrhagic spermatic cord was exposed. The hemorrhagic mass extended from internal ring to testicle. It was dull red and held together by tunics of the cord. The blood-filled tissues along with several engorged veins of pampiniform plexus were removed. No bleeding points were seen. No sac was demonstrable. Wound was closed by layers without drainage. The cord was not displaced. Recovery was uneventful.

CYSTOSCOPY AND REPORT OF THREE UNUSUAL CASES.

By L. B. MARSHALL, Lieutenant, Medical Corps, United States Navy.

Cystoscopy is defined as the examination of the urinary bladder with the cystoscope. The instruments used may be direct view, indirect view, air dilating or water dilating, and electric lighted. The best instruments are the direct and indirect water dilating cystoscopes. These instruments may also be used in urethroscopy.

Indications for cystoscopy are many, such as frequent and painful micturation—if there are no urethral conditions, nocturia, blood in the urine, enlarged prostate, stones, pain over kidney and bladder region, anuria, and many others.

More and more is the cystoscope becoming a recognized and an mperative aid in diagnosis. Many baffling and obscure cases can be easily cleared up with the aid of a trained urologist.

Of course the use of the cystoscope is only one part of a thorough urological examination. It is a good plan to go over the entire genito-urinary tract in every patient referred for examination. This examination should include inspection, palpation, and percussion to exclude conditions that may be so demonstrated. There should be macroscopical, chemical, and microscopical examinations of the urine; rectal examination in the male, and both the rectal and vaginal examination in the female; X-ray plates, urethroscopy, and cystoscopy.

The technique of cystoscopy is simple after one has established a certain routine and adheres strictly to it. Most anyone can pass a catheter or even a cystoscope after a bit of practice and through a normal urethra, but to pass an instrument through a strictured urethra or over an enlarged prostate is a different matter and requires skill, patience, and a good anatomical knowledge.

The operator first must know the appearance of a normal urethra and normal bladder before he can recognize pathology. In examining he must be slow, careful, and thorough in his work. He must

74459—24——5

Digitized by Google Original from UNIVERSITY OF MICHIGAN

look for and be able to recognize the stones, tumors, enlargement of any or all lobes of the prostate, diverticula, trabeculations, and sacculations, tubercles, scars of previous surgery or injury, cystitis, foreign bodies, gaping of ureteral orifices, blood issuing from the ureters, inflamed ureters, and so on.

The technique of cystoscopy described below is simple, easy to carry out; and if followed the examination is made thoroughly and rapidly and with the minimum of discomfort to the patient.

The patient should be given a cathartic the night before so that fecal masses will not interfere with the passage of the cystoscope. The bladder should be emptied just before getting on the table. The patient is divested of all clothing below the waist and has on a large gown or bath robe; he is placed in the lithotomy position, with head raised, hips on the edge of the table and slightly elevated. The feet are supported on stirrups swung well outward. In females the genitalia are washed thoroughly with warm water and tincture of green soap. In males the glans and meatus are cleansed with alcohol and covered with a piece of sterile gauze. Sterile sheets are draped so that all surrounding parts are covered. The examiner, in sterile gown and gloves, introduces into the meatus a cotton applicator dipped in sterile 10 per cent solution of cocaine, a little K. Y. jelly is picked up on the applicator for lubrication. Two applicators are introduced, one following the other. Allowing sufficient time for anesthesia, 10 to 15 c. c. of a sterile 4 per cent solution of cocaine is introduced with a curved syringe long enough to reach the vesical neck. This anesthetizes the urethra, vesical neck, and bladder and makes instrumentation practically painless. Direct or indirect cystoscopes are used according to preference. The scope is then well lubricated and, in almost the same fashion as introducing a sound, passed carefully into the bladder. The urine remaining in the bladder is then evacuated, sterile warm water or boric acid is passed through the cystoscope, and the bladder washed out. The light is turned on and the examiner, sitting on a low stool, thoroughly explores the bladder surface. The ureters are then catheterized, the cystoscope removed, and specimens of urine from each kidney collected for chemical and microscopical examination and for cultures. The functional test of each kidney follows, using phenolsulphonepthalein intravenously. After the functional test, pyelograms are made with the catheters in place and kidney injected with sodium iodide, 33⅓ per cent. Particular attention must be taken not to allow the patient to move while the ureteral catheters are in place or they may drop down into the ureters and the pictures be unsatisfactory. If considered necessary, cystograms are also made.

The contraindications of cystoscopy are practically none except, of course, acute inflammatory conditions and a few cases with

Digitized by Google Original from UNIVERSITY OF MICHIGAN

extreme pain in which the symptoms might be aggravated by cystoscopy. In these cases it is better to wait and let the symptoms subside. There might be an anuria following cystoscopy, but very seldom.

It is wise to have the patient remain quiet for an hour or two following cystoscopy because some cases have a slight reaction. There may be nausea and vomiting, malaise, and even a slight chill and temperature, but this does not happen in the vast majority of cases and soon disappears with symptomatic treatment.

The urologist now has an absolute and positive knowledge of the genito-urinary tract and is able to make his diagnosis and plan his treatment with the confidence of getting the results he expects.

The technique of cystoscopy described is the one used by Dr. Oscar Owre, chief of the urological services of the Swedish and General Hospitals, Minneapolis, Minn., and the cases reported are from his service. I am indebted to him for the opportunity of observing and obtaining the case reports.

These cases show the importance of cystoscopy in any condition referable to the genito-urinary tract and especially those in which surgery is contemplated.

Case 1.—Mrs. M. J. Age 28 years, white. Admitted to the genito-urinary service of the General Hospital of Minneapolis, May 20, 1923. Principal complaint, painful and frequent urinations with bright red blood in urine. Pain over kidney regions. Urination well controlled but severe nocturia. Duration two weeks, except with some little discomfort two months ago. Physical examination practically negative. Sound introduced into the bladder, seemingly encountered some object.

X ray.—Mass in bladder region, about the middle, shaped like a large section of rubber tube, not very dense, mass lying with long diameter in transverse diameter of bladder. Tentative diagnosis—foreign body in bladder with calcification around it. Cystoscopy requested.

Cystoscopy.—Bladder had thick coating over all its walls, more marked along ureteral ridge and trigone. Ureters markedly injected and covered by dense flaky masses. Large mass, oblong in shape, apparently green in color noted. No metallic sound elicited. Mass freely movable. Too large to be drawn through cystoscope, in fact pieces of the mass pulled away with the forceps when removal was attempted. Cystotomy decided upon.

Cystotomy.—Suprapubic incision under gas anesthesia. Peritoneum reflected and bladder opened in usual way. Foreign body delivered was 3 inches long and three-fourths of an inch wide and one-eighth of an inch thick, resembling a piece of pork rind. Wound

Digitized by Google Original from UNIVERSITY OF MICHIGAN

closed. Laboratory report, slippery-elm bark. Patient discharged, well, June 27, 1923, following an attack of measles.

Case 2.—Mrs. R. H. Age 29 years, white. Admitted to the gynecological service of the General Hospital, Minneapolis, Minn., May 29, 1923. Principal complaint, pain in lower abdomen, backache, and bleeding from the vagina. About three months pregnant. The patient was a very obese woman with negative history and negative examination, except for the above symptoms and history of attempted abortion with a piece of slippery-elm bark. Following failure of symptomatic treatment, cystoscopy was requested. X-ray examination showed shadow, but it was not definitely determined whether fecal material in rectum or foreign body in the bladder.

Cystoscopy.—The bladder had a thick coating and film over posterior wall. Considerable flaky material floated in fluid. A mass observed in right posterior portion of the bladder. Freely movable. Size through cystoscope about 1½ inches long. Mass apparently smooth. Metallic sound not elicited. Mass too large to be drawn through cystoscope and cystotomy decided.

Cystotomy.—Suprapubic incision under local anesthesia. Bladder opened in usual way and foreign body removed. The mass was about 12 inches long, three-fourths of an inch wide, and one-fourth of an inch thick. Laboratory report, slippery-elm bark. Patient later died after aborting, followed by septicemia. This patient had evidently tried to abort herself with the piece of bark and had introduced it into the urethra and so on into the bladder. It was remarkable in this case that there were no severer symptoms pointing to a bladder condition.

Case 3.—Rev. L. Age 57 years, white. Admitted to the Swedish Hospital, Minneapolis, Minn., for a cystoscopy, requested by his attending physician. Principal complaint, nocturia and retention of urine, so much so that several times it was necessary to catheterize him. Some pain on urination.

Cystoscopy.—Dilated bladder. Enlargement of two lobes of prostate. Diverticulum just above and to the left of right ureteral opening large enough to admit the tip of the cystoscope. Small papilloma on right posterior wall of the bladder. Trabeculations and sacculations. A small phosphatic calculus behind the enlarged prostate and lying in one of the sacculations. Four distinct pathological conditions being revealed.

This case shows how extremely important it is to always cystoscope before attempting surgery on the genito-urinary tract. Should a prostatectomy have been done without cystoscopy, it is very probable that the stone, papilloma, and diverticulum would all have been missed, and not even a suspicion aroused as to their presence, for the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

blood and water would have obscured vision. And not only would the pathology have been missed but it is very likely that the papilloma would have taken on new and sudden growth and extended down into the prostatic area, possibly becoming malignant and necessitating a subsequent operation, with perhaps loss of life. This case has not yet come to operation but it will, and it will be a very interesting one to observe. In this case a cystogram should also be made to determine the size and position of the diverticulum.

The first two cases show some of the things that may be found in the bladder. The last case shows how many different types of pathology may be found in a single bladder.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS.

THE VALUE OF PSYCHOMETRIC TESTS IN THE NAVY.

In connection with the article on "The detection of the psychopath and the classification of naval recruits in accordance with their intelligence" by Lieut. A. W. Stearns, Medical Corps, United States Naval Reserve Force, which appears elsewhere in this number of the BULLETIN, it is interesting to note the substance of a report made to the academic board of the United Stated Naval Academy giving the results of the psychometric tests devised by Doctor Stearns as applied to 731 midshipmen comprising the fourth-year class during the academic year 1922–23. This report sustains Doctor Stearns's claims concerning the utility of the test. The value of the test to the academic board in the future will be in giving some indication at the end of the first term of the advisability of retaining in the service a midshipman who had "bilged," as it was found that in every instance the ability of the midshipman as revealed by this test corresponded closely to his class standing.

As a result of the psychometric tests the midshipmen were arranged in six groups. The number in each group, the number who failed at the end of the academic year, and the percentage of failures in each group are shown in the following table.

Grouping.	Number in each group.	Failed.	Percentage.
A. 95–100	132	3	2.2
B. 90–95	159	14	8.8
C. 85–90	162	20	12.7
D. 80–85	124	17	13.0
E. 75–80	78	14	18.7
F. Below 75	76	15	19.3

It will be noted that there are 291 marks of 90 or above. However, making allowance for the special preparation which most candidates undergo prior to admission to the Academy which may have resulted in the passing of many midshipmen of low intelligence at the end of the term, the ratio of intelligence, if plotted on a curve, will be seen to be progressive. This test will be repeated at the end of the present term and it will be interesting to note whether more of the Group D, E, and F men fail after the effect of early coaching has disappeared.

For some time the Bureau of Medicine and Surgery has been endeavoring to find a simple test that could be used to detect the men-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tally unfit at recruiting offices. The tests that have been suggested are either so complex that they require more time than can be given to each recruit, or else demand interpretation by a trained psychiatrist. Lieutenant Stearns believes that in the physical examination of recruits "improvement could be made if a history were taken and if more emphasis were placed upon function and less upon anatomical findings." In his article he describes a history card that comprises the data that is already included on the present application for enlistment and enrollment used at recruiting stations. On the back of this blank is the record for medical examination, and therefore the medical officer has accessible the answers made by the applicant. Following Doctor Stearns' suggestions as to interpretation of a similar questionnaire the medical officer at a recruiting station should be able to use this data to determine the grossly unfit. Clues can be followed by further questioning during the medical examination. It is well to remember, however, that Doctor Stearns very practically recognizes that the Navy can use men of all degrees of intelligence above the feeble minded, but it is obviously wise to use them for different work. Rather dull men can be used for general detail and in the fireroom. Brighter ones are needed to enter the various schools. When Lieutenant Stearns came to the Naval Academy to demonstrate the method of conducting his intelligence test, several line officers who had used it at training stations spoke of its value in choosing applicants for the special schools. It has a practical economic value as well as in promoting efficiency and should be used at every training station. This intelligence test can be given by a chief petty officer if necessary, and even the marking and scoring with a little training can be readily mastered by the layman. The attention of medical officers is therefore especially directed to this article by Lieutenant Stearns, and it is hoped that the methods advocated will be fully tried and reported upon.

THE NEED OF PHYSIOTHERAPY.

"A department of physiotherapy may not be needed by every hospital, but every hospital needs physiotherapy and a physiotherapist." Thus did Dr. John Harvey Kellogg, superintendent of the Battle Creek Sanitarium, begin one of the most significant papers read at the twenty-fifth conference of the American Hospital Association, which was recently held at Milwaukee.

"Within the last half century," says the author of this paper, which appears in The Modern Hospital of November, 1923, "a most remarkable evolution, one may even say revolution, has occurred in methods of dealing with the sick. The marvelous light thrown upon life processes, normal and pathological, by the revelations of physi-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ology, bacteriology, and physiological chemistry, and the exposures of the fallacies of old therapeutic notions, and the inertness or inadequacy of the great majority of drugs made apparent by experimental pharmacology and clinical observation checked up by modern instruments of precision, have so completely transformed the practice of medicine that the war of the 'pathies' ceased years ago for lack of anything of interest to war about. Everybody knows, nowadays, that sick people are not cured by either big pills or little pills, but by the *vis medicatrix naturæ*. * * * We have a very few specific drugs which cure by destroying parasites of some sort; but with very few exceptions the agents which are really potent in combating disease are those which modify the blood or the blood supply, and these agents are almost wholly those which belong to the domain of physiotherapy, which includes all therapeutic measures other than drugs and psychic influences.

"The modern general hospital is supposed to be a place where the sick may receive the benefit of every curative method and resource recognized by scientific medicine, and there seems to be no good reason why the modern general hospital should not realize this ideal in its equipment and the personnel of its staff of physicians and nurses.

"If the question of expense is raised, the objection is easily answered by the fact that for a very efficient application of physiotherapy very little expensive or special equipment is actually required. The great essentials of physiotherapy, in addition to diet, are air and water at different temperatures, light and exercise, active and passive. These most potent of all means of modifying metabolism and nutrition may be applied in a thoroughly efficient manner and with most satisfactory results without the use of very expensive or elaborate apparatus. The most important part of a physiotherapeutic equipment is a thorough, theoretical knowledge of physiotherapy. With this, great results may be attained with little or no special equipment; without it, the most elaborate equipment is useless. * * * The teaching of physiotherapy in our medical schools is still so inadequate and inefficient that the student has no opportunity to become sufficiently familiar with the technic to be able to make an intelligible prescription. Although now recognized as the chief part of therapeutics, it receives the least attention. * * * This neglect of physiological therapeutics by our medical schools is without doubt responsible for the existence of osteopathy, so-called chiropractic, and a dozen other medical cults."

Physiotherapy has come to be the greater part of therapy and all medical officers should become familiar with the methods and appliances for employing the various physical agents by which the body functions may be influenced. Physiotherapy equipment, which has

Digitized by Google Original from UNIVERSITY OF MICHIGAN

been found of value in naval practice, has been installed in our naval hospitals and several medical officers, and nurses have made a special study of its use. This branch of therapeutics affords an opportunity for profitable specialization, as the time is probably not far distant when the physiotherapy department with a specially trained personnel will be just as essential in the equipment of the naval hospital as is the operating room, laboratory, or diet kitchen.

TWO PHYSICIANS OF TORTOLA.

Medical officers who have served in the Virgin Islands will recall the British island of Tortola, which is separated by a narrow channel from the island of St. John. On Tortola from 1741 to 1786 there was a colony of settlers belonging to the Society of Friends. According to the British Medical Journal of October 20, 1923, Mr. Charles F. Jenkins, of Philadelphia, has made it a labor of love to collate all available material bearing on these peace-loving worthies, and the result is a very interesting little book called *Tortola: A Quaker Experiment of Long Ago in the Tropics*, published last year.

"For the medical historian," says the British Medical Journal, "Tortola has the lure that here (or at least on the islet Little Jost Van Dykes, reckoned as a part of the larger island) was born in 1744 Dr. John Coakley Lettsom, who became later known to fame as the distinguished London physician and founder of the Medical Society of London. He dressed plainly and simply after the manner of Friends of the day, and was formally received by the King on more than one occasion, without the required court dress or sword. * * * His many activities gave him little time for Quaker activities, yet he always regarded himself as a member. 'I was born a Quaker,' he tells a correspondent, 'and what is still more strange I was born so within the Tropics.' Eleven years before his death he said, 'I am no bigot, even thinking as well of other religions and sects as I do of that in which I was born and now remain—as I believe, the only Quaker in the world a *West Indian.*' He is said to have been one of the seventh pair of boy twins born to his mother, of which number he and his brother Edward were the sole survivors. Sent home as a boy of 6, he only once revisited the island (in 1767), to take over his father's estate, and one of his first acts was to free all the slaves he had inherited. His youngest son, Pickering Lettsom, was named after John Pickering, the Quaker governor of Tortola. Pickering was eventually superseded during the war with Spain because, with other Friends, he would not 'engage an enemy or use offensive weapons.' The younger Lettsom settled on the island and practiced his profession as a lawyer there. Doctor Lettsom is buried in Bunhill Fields Friends' burying ground, with George Fox and Edward Burrough. Another medical Tortolian was Dr. William Thornton, a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

son of one of the active early members of the Tortola meeting. He was sent to England for education, became a druggist's clerk at Ulverston, and studied medicine, like Lettsom (whose friend and warm admirer he became), at Edinburgh. After completing his studies he returned to Tortola, and succeeded to an ample fortune; later he went to Philadelphia, where he was fired with a desire to repatriate personally the free blacks of the North, as well as the 70 slaves who had come to him by inheritance at Tortola. One or more ill-fated expeditions had already sailed with this object from England to Sierra Leone, and Doctor Lettsom dissuaded him from the venture, so Thornton remained in New England furthering his repartriation plans from Philadelphia. Here he married, and, having considerable—although entirely untrained—skill as an architect, produced, in competition, the winning plan of a new building for the Philadelphia Library which Franklin had founded some years before. This building still stands, though used for other purposes. After a time he returned to Tortola and practiced for a considerable period as a physician. In 1792, while still there, an advertisement by Thomas Jefferson, Secretary of State, for plans for the President's house and for the Capitol drew Thornton again to Philadelphia to submit his designs. Although he was late and the competition closed, none of the 14 plans submitted had proved satisfactory. President Washington, on seeing and admiring Thornton's drawings, got the commissioners to accept them, and the Capitol building, 'probably the best known and most imposing structure in America,' was erected substantially from his design. Thornton became the friend of Washington, was made one of the three commissioners for building the city, and in 1802 was appointed first Commissioner of Patents, which post he held till his death in 1828."

THE ALL-PURPOSE CANISTER GAS MASK.

At the Twelfth Annual Safety Congress, Capt. L. M. McBride, Chemical Warfare Service, United States Army, delivered an address on the "Uses of the all-purpose canister gas mask at sea" before the marine section of the National Safety Council. Although the uses of the gas masks are familiar to all naval medical officers it is interesting to note how necessary this appliance, as a part of the equipment of merchant vessels, has become. The following abstract of Captain McBride's remarks are reprinted from the National Safety News of November, 1923:

"In considering the use of all-purpose canister gas masks on board ships, for protection against such gases as may be encountered in ordinary service, it is first necessary to understand the nature and occurrence of these gases and what protection is necessary and available.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Conditions on board ship resemble those of a city, since the ship requires practically all the conveniences and utilities necessary for normal living conditions. A ship has her stores of food, fuel, and other commodities, facilities for cooking, heating, lighting, refrigeration, and ventilation. Due to her hazardously isolated position at sea, whereby the ship must rely on her own resources, it is essential that she be equipped with every necessary device to maintain the safety of passengers and crew against all contingencies. Among the foremost of safety measures is the fire-fighting equipment. Since practically all the gases met in fighting fire on land may be encountered in fires at sea, it is essential that the seamen be fully equipped with the most efficient means of protection against gas.

"Gases, however, may be encountered at other times as well as during fires. The nature of the service requires operations which cause the generation of dangerous gases and fumes. Cargoes may consist of every known commodity, which, in the advent of accident or fire, are sources of danger. Such gases, smoke or fumes, may result from accidents to machinery, burning out of electrical insulation, improper combustion of oil in engines and boilers, and other sources.

"Acetone, alcohols, aniline, benzine, carbon bisulphide, ether, turpentine, naphtha, toluene, and other substances enter into the manufacture of rubber, dyes, paints, varnishes, lacquers, shellac, insulation, celluloid, chemicals, and other materials which may be part of the cargo or the ship's equipment, while listed below are the more common gases against which protection should be provided:

"Acid fumes, ammonia, carbon bisulphide, carbon dioxide, carbon monoxide, carbon tetrachloride, carbonyl chloride (phosgene), chlorine, chloroform, chloropicrin, cyanogen chloride, formaldehyde, petroleum fumes, hydrogen chloride, hydrogen cyanide, nitrogen peroxide, and sulphur dioxide.

"Consideration should be given to the fact that many of the poisonous gases are heavier than air and, therefore, tend to settle in the hold, from which they must be removed by artificial means.

"Among these gases are a few against which the standard Army gas mask gives no protection. The most common and the most insidious among them is carbon monoxide, which is responsible for more deaths in civil life than all other gases combined. Carbon monoxide has no odor, taste, or color and it gives no warning of its presence by irritation of the eyes or throat. It is a product of fires due to incomplete combustion of carbonaceous materials, from furnaces and similar sources. It is most likely to occur on shipboard from smoldering fires in cargoes, holds, or coal bunkers.

"No provision was made during the war to develop a gas-mask absorbent to protect against it as a war gas. There was, however, a demand for such an absorbent for use by the U. S. Navy in sub-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

marines and in the gun turrets of battleships. This demand was met by the development of a carbon-monoxide mask containing an absorbent known as hopcalite which acts catalytically on carbon monoxide, causing combination with the oxygen of the air to form carbon dioxide, which may be breathed to the extent of 2 or 3 per cent without harmful results, whereas about one-half of 1 per cent of carbon monoxide would be fatal.

"Ammonia is encountered in industry, principally around refrigeration plants. An early means of protection against ammonia was the use of pumice stone impregnated with sulphuric acid. This had many disadvantages and was superseded by the development of pumice impregnated with copper sulphate and known as kupramite. Silica gel has also been developed as a gas-mask absorbent to give protection against ammonia.

"With these developments available, the Bureau of Mines designed a gas mask to give protection against all noxious gases met with in ordinary industrial, chemical, and metallurgical practice and for use by city fire departments. This mask is known as the universal gas mask. A short time later, the Chemical Warfare Service was called upon to furnish such a mask for use by various Government departments. This mask uses hopcalite to give protection against carbon monoxide and cobaltous chloride as an ammonia absorbent. This mask is known as the all-purpose mask. There is also a commercial mask which embodies the above principles and is known as the all-service mask. The construction and operation of all of the foregoing masks are similar.

"Another common source of danger from gases aboard ship is from those remaining after fumigation.

"The U. S. Public Health Service has recently adopted a new method of ship fumigation, consisting of the generation, in place, of a mixture of cyanogen chloride and hydrogen cyanide. Bilge water will absorb about 100 milligrams of cyanogen chloride per liter for an exposed surface of 27 inches. Cyanogen chloride will condense on brass at the rate of 42 milligrams per 1,000 square inches of surface, and on steel at the rate of 125 milligrams, at an average temperature of 54½° F. Consequently, these gases are likely to be present after fumigation and it is unsafe to enter any closed space for some time after fumigation without a gas mask.

"Gasoline and other petroleum vapors are more dangerous than commonly supposed. On account of their low boiling points, these liquids evaporate rapidly upon exposure to air. An empty gasoline or oil tank will give off dangerous fumes and there is usually a small quantity of the liquid left in the bottom of the tank, even after steaming or other methods of cleaning have been resorted to. The remaining sludge, when stirred up in cleaning, inspecting, or repair-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ing the tank, will give off dangerous quantities of gas. The inhalation of benzine, gasoline, or other petroleum vapors causes headache, dizziness, and frequently an intoxication in which the person becomes excited and hysterical. Higher concentrations will cause unconsciousness or even death. Such tanks should be entered with extreme caution and seldom, if ever, without some means of protection.

"The all-purpose mask will give protection against these vapors for a short time only, the time depending upon the concentration of gas. To be safe, one should not remain in the tank for more than 5 or 10 minutes at a time. If a longer period is necessary to complete the work, the men should go out and change masks. It has been found that thin rubber and rubberized cloth are permeable to gasoline and similar vapors; hence the mask should be thoroughly aired before it is again used.

"The safest equipment to use in such tanks is either the oxygen breathing apparatus of the type approved for protection against the penetration of gasoline vapor, or the hose mask, which consists of a face piece of the Tissot type with hose attached which leads to fresh air. Both types are now available commercially. In any event, no person should enter a tank without having a stout rope attached to him so that he can be removed if overcome.

"Chemical fire extinguishers, especially those of the carbon-tetrachloride type, should be used in closed spaces only when the operator is protected by a gas mask, owing to the toxic gases by the action of heat on the contents of the extinguisher. The basic gas is necessarily heavy in order to blanket the fire and consequently hard to dissipate.

"Gases and dusts emanating from fires in cargo and bunker coal or as an after result of explosions require some means of gas protection. Two analyses of the gas from samples of coal made by the Bureau of Mines showed two and three per cent of carbon dioxide and 12 and 39 per cent of methane (fire damp) in addition to other gases. There is no adequate absorbent for methane, but this gas is harmless in itself unless present in sufficient quantity to reduce the oxygen content of the air below 13 per cent. A gas mask is no protection when the atmosphere is deficient in oxygen. In such cases an oxygen apparatus or hose mask should be used.

"The all-purpose gas mask consists of three principal parts, the face piece, the canister, and the carrier. The face is of the Tissot type, without nose clip or mouthpiece, and is made of rubber stockinette. Adjustable bands form a head harness which holds the mask firmly and comfortably in place. Purified air from the canister enters the face piece through a corrugated flexible tube attached to a metal angle tube in the face piece. Attached to the angle tube on the inside of the face piece is a rubber deflector which distributes

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the incoming air over the lenses to prevent dimming from condensation of moisture on the glass. Expired air is exhaled through a rubber flutter valve attached to a separate opening through the angle tube. The canister is a modification of the present Army type.

"The life of the canister depends upon a number of variable conditions, such as the concentration of gas, the rate of flow of air through the canister, which is in proportion to the exertion by the wearer, the temperature and humidity of air, etc. Under ordinary conditions and concentrations the canister has a life of from four to six hours' continuous use.

"All gases except carbon monoxide may be detected by odor when the canister 'breaks,' that is, permits gases to pass through. However, the canister gives protection beyond the point and permits the wearer to withdraw to a safe atmosphere.

"The number of gas masks required for ship equipment may be closely estimated by the extent of the fire-fighting equipment. There should be a sufficient number available to equip all men required to go into any part of the ship in case of a serious fire. Masks should be so distributed that regardless of where a fire may break out or an accident happen masks and extra canisters will be available. There should be at least one mask with each chemical extinguisher.

"Extra masks should be maintained adjacent to ammonia refrigeration equipment, in boiler rooms, and wherever it is necessary to enter any confined space after fumigation. Extra canisters should be maintained to meet any emergency. Gas masks should be kept where the canister will be dry, but not in a place where the rubber parts will deteriorate, such as adjacent to steam pipes or places where the temperature is high. Extra canisters should be kept hermetically sealed as when received and in dry cool storage."

THE ETIOLOGY OF GOUT.

The elucidation of the etiology of gout has vexed the minds of many thoughtful physicians from time immemorial and we to-day are far from a solution of the pathological mystery of this disease. However, Dr. R. Llewellyn Jones Llewellyn, of London, advances some interesting speculations on the subject in a paper which appeared in the New York Medical Journal of November 21, 1923.

That a predisposition to gout is hereditary is beyond question. This hereditary predisposition Doctor Llewellyn assumes to be the result of protein sensitization and this assumption explains many of the clinical phenomena peculiar to the disease, such as asthma, urticarial and exzematous eruptions, and food idiosyncrasies.

"The food idiosyncrasies of the gouty," says the writer, "are proverbial, not eclipsed even by the asthmatic. Some appear hypersen-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sitive to beef, others to pork or veal, some to shell fish, others to certain vegetables or fruit, e. g., strawberries. The almost fulminant swiftness of the response in some instances frankly suggests that the gouty outbreak is due to the absorption of unaltered protein, and, moreover, the digestive derangement of the gouty would seem to favor the intrusion of unaltered protein or cleavage products."

The well-known effect of alcoholic beverages on gouty subjects, according to the writer, is not due to the alcohol per se, but to the proteins such as hordein in malt liquors or the protein material contained in the yeast cells in wine. In those following the occupations which have always been considered as contributing to gout, namely, coachmen, grooms, stablemen, farm laborers, maltsters, brewer's laborers, and so forth, the predominant incidence of gout is due probably to the fact that those in whom the disorder develops are sensitized to some protein incident to the occupation.

According to this writer, who bases his opinion on the researches of Dale, the articular and abarticular phenomena of gout are due not to the direct action of toxins generated by organisms in some local focus of infection, as has been claimed, but they are the outcome of an anaphylactic reaction to the proteins of the said organism.

The salient features of anaphylaxis, as Dale has shown, are spasms or tonus of unstriped muscle, e. g., the bronchioles, and poisoning of the endothelial cells of the capillaries. One or the other of these effects may predominate in different species of animals, and thus give rise to symptoms, which though superficially dissimilar are yet fundamentally due to the same species of morbid action.

That they are due to one common type of poison is, in Dale's opinion, further confirmed by the fact that these same symptom complexes may be produced by a whole group of natural poisons—partial cleavage products of protein formed by bacterial or other ferments.

In like fashion in man, under natural conditions of life, there may occur that particular sequence of events essential for the artificial induction of animal anaphylaxis; in other words, an entry into the blood of unaltered or incompletely digested proteins, an interval, then a second entry with resulting explosion. When such occurs, the salient features of anaphylaxis are reproduced, and find clinical expression in asthma, skin eruptions, arthropathies, vascular hypotension and eosinophilia. In some individuals urticaria, in others bronchial asthma, or arthropathies, may be the predominant manifestation.

The varied clinical phenomena of serum sickness or anaphylaxis in man certainly resemble gout, in its regular and irregular aspects. In both joint swelling, asthma, skin eruptions, vascular hypotension and eosinophilia occur.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The writer believes that the initial change in the joint in acute gout is a toxic poisoning of the endothelium of the vessels and capillaries in the joint area producing a cellular sensitization.

The writer concludes the paper with a summary which is quoted in part as follows:

"In attempting to summarize my views on this vast subject—the etiology of gout—I would remind you that Dale holds that sensitization—in anaphylaxis—is cellular and not humoral in location. In other words, that in vascular endothelial poisoning, the anaphylactic symptoms are not due to collision of the antigen and antibody in the blood stream. For his researches show that the antibody is located in the cell, and that it is there in the cell body itself that the reaction with the corresponding protein or antigen occurs. Hence the anaphylactic symptoms—possibly the result of intracellular precipitation.

"On this basis the pathological groundwork of gout resides in a tendency to cellular sensitization. The same may remain latent, but once established it will—given contact with the related protein or antigen—at any moment explode. The explosion takes the form of vascular endothelial poisoning, and as the same operates through the medium of local ischemia and venous stasis, it is not surprising that the clinical manifestations thereof should be extremely diverse, for the symptoms will naturally vary with the regional distribution of the circulatory stasis, and the structure and function of the organ or tissue implicated.

"If situated in a joint, it results in regular gout; if in the lung, asthma; if in the skin, urticaria, or eczematous eruptions, viz, irregular gout. Accordingly, if we accept cellular sensitization as the basal pathological change in gout, and that the same achieves its malign effects through vascular endothelial poisoning, we seem to glimpse the inward meaning of the clinical mosaic presented by the regular and irregular manifestations of gout.

"Incidentally, too, much of the mystery attaching to gouty metastases disappears, even the much maligned retrocedent gout becomes intelligible. Thus, if an acute gout in the toe suddenly abort, and alarming gastric symptoms as suddenly ensue, viz, intense abdominal pain, collapse, vomiting, sometimes of blood, may not these gastric symptoms be due to a local endothelial poisoning, a gastrostasis?

"Conversely, in those authentic instances where an aphasia, an amnesia, or a hemiplegia, disappears with the onset of frank gout, may not the cerebral symptoms be due to temporary stasis in the related cortical vessels?

"Again, may we not find herein a facile and no less a rational solution of those many recorded examples in which a fleeting erythemata or urticaria has, like a bout of asthma, vanished with the sudden out-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

break of acute classical gout; or alternated therewith in that dramatic fashion so graphically portrayed by the older physicians, to whose masterly clinical insight modern research ever brings increasing tribute?

"Lastly, it seems to me that this conception of the etiology of gout opens up an encouraging vista for more efficient and, I would fain add, more scientific therapy. May not skin protein tests, if applied to the gouty, yield as rich a harvest of information as has already been gleaned in asthma? May not withdrawal of the offending protein, whether vegetable, animal, or bacterial, prove as prophylactic in the one as in the other? May not our sheet anchor—colchicine—even act as a desensitizer?"

BULLETIN OF THE NATIONAL BOARD OF MEDICAL EXAMINERS.

The first issue of the National Board Bulletin appeared in October, 1923. The National Board of Medical Examiners began the publication of this periodical for the purpose of keeping the board's candidates and others interested in its work more fully informed of its program and progress. From the first issue we learn that during the past year seven State boards of medical examiners have perfected arrangements for the acceptance of the certificate of the national board, in lieu of their own examination of candidates for licensure. The States are as follows: Illinois, Maine, Massachusetts, New York, South Carolina, Tennessee, and Texas. In Illinois, Massachusetts, New York, and Texas it was necessary to amend the medical practice acts so as to give the State boards authority to take discretionary action. In the other States the present laws were sufficiently broad to permit recognition by direct action of the board. In Maine the State board will give candidates holding the national board's certificate a brief examination, which may be oral and practical in nature. In several States, including New York and South Carolina, the State boards reserve the privilege of reviewing each candidate's credentials.

Several other States are giving favorable consideration to recognition of the national board certificate, and are ready to extend cooperation as soon as amendments to their medical practice laws can be secured or a plan of acceptance worked out which will accord with the provisions of the present statutes.

The States accepting the national board's certificate now total 28, and are as follows: Alabama, Arizona, Colorado, Connecticut, Delaware, Georgia, Idaho, Illinois, Iowa, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, Washington.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

PRACTICAL OBJECTIVES IN HEALTH WORK.

At the National Conference of Social Work held in Washington, D. C., May 17, 1923, the late Dr. Hermann M. Biggs delivered an address on "Practical objectives in health work during the next twenty years." According to Health News, the monthly bulletin of the New York State Department of Health, this was the last public speech by Doctor Biggs. At the end of the address he summarized some of the most important health objectives as follows:

1. Establishing the custom of obtaining periodic physical examinations of every individual made by competent physicians.

2. Provision of systematic instruction in elementary physiology and hygiene and in health habits in the primary and secondary schools, and more extensive instruction in the normal schools and universities.

3. Further reduction in the death rate from the common infective diseases, such as tuberculosis, diphtheria, typhoid fever, scarlet fever, diarrheal diseases of infancy, etc.

4. Postponement of the age at which death occurs from the cardiovascular diseases and the other diseases of later life, through physical examination and instructions as to methods for retarding or arresting their progress.

5. Continued efforts, through research, to solve the problems connected with the causation and prevention of the acute respiratory diseases and cancer.

6. Continued efforts to prevent and cure certain diseases of nutrition and metabolism, such as diabetes, scurvy, rachitis, and gout.

7. The prevention by education and law enforcement of new infections in the venereal diseases, and provision for more adequate treatment of syphilis.

8. The extension of the educational work of the public health authorities as a most effective means to promote the preservation of health and the prevention of disease.

9. Better and more extensive organization of the prenatal, maternity, and infant work, and the care of the preschool child.

10. The extension of the work in mental hygiene and oral hygiene, including ample facilities for treatment.

11. The efficient development and extension of medical school inspection, and its follow-up with the provision of adequate facilities for the treatment of the diseases and defects found in school children.

ALCOHOL TAXATION AND ALCOHOLISM IN DENMARK.

In connection with a review of Dr. V. S. Vecki's book on "Alcohol and Prohibition," which appears elsewhere in this issue of the BULLE-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TIN, it is interesting to note some of the aspects of prohibition as revealed by other countries. According to the British Medical Journal of November 3, 1923, "each of the four Scandinavian countries is at present conducting different legislative experiments in the control of alcohol consumption. While one country rations the supply of alcohol, another attempts to enforce prohibition, and a third—Denmark—attempts to encourage sobriety by making the cost of alcohol almost prohibitive. The year 1917 was one of legislative ventures in Denmark. For a very brief interval the total prohibition of spirits was attempted, the law of February 27 forbidding the sale and serving of spirits. This law was revoked on March 23 of the same year, since when, there has been no prohibition in Denmark. But in that month the retail cost of spirits was doubled by taxation, and on December 21, 1917, the taxation of spirits was further raised so that a bottle of spirits which had cost 70 öre before the war could not be bought for much less than kr. 10. In a paper recently published by Dr. K. H. Krabbe an attempt has been made to investigate the influence of this legislation on the sobriety of the Danish nation. He observes that it is difficult to compile statistics dealing with chronic alcoholism, partly because there are no hard and fast lines within which this condition can be defined, and partly because the personal equation (that is, the opinion of the individual physician) is variable. But there can be no mistake about the diagnosis of acute alcohol poisoning or delirium tremens, which seldom occurs in an abortive form. The actual number of such cases may not be an index to the number of cases of chronic alcoholism in the same community, but a study of the yearly fluctuations in the number of cases of delirium tremens should afford a rough guide to the fluctuations in the incidence of chronic alcoholism. At any rate this is Doctor Krabbe's opinion. His statistics deal with the number of cases of delirium tremens admitted every year to his hospital since 1903. In the period 1903–1916 this number ranged from a minimum of 249 in 1915 to a maximum of 447 in 1907, the average for this period being 321 a year. In the period 1913–1922 the number of these cases ranged from a minimum of 9 in 1918 to a maximum of 26 in 1921, the average being 15 cases every year. (In 1922 there were only 11 cases.) It will thus be seen that 95 per cent of the anticipated incidence of delirium tremens had been eliminated. Doctor Krabbe considers there can be little doubt that this decline in the incidence of delirium tremens did not merely coincide with the imposition of heavy taxes on spirits, but was the direct outcome thereof. He raises the question: Would it be possible by total prohibition to eliminate the remaining 5 per cent of the anticipated cases of delirium tremens? He answers this question in the negative, assuming that this 5 per cent dreg represents those

Digitized by Google Original from UNIVERSITY OF MICHIGAN

members of the community who must have their liquor at all costs, and who, if spirits are prohibited by law, obtain it by smuggling or distilling it at home. Failing these alternatives, there is yet the possibility of drinking methylated spirits or ether. The lesson which Doctor Krabbe draws from his figures and from a comparison of conditions in Norway and Denmark is that high taxation of spirits has quite as sobering an effect on a community as prohibition, the circumventing of which has a demoralizing effect, encouraging a contempt for the law of the land."

REVISION OF THE PHARMACOPŒIA.

Two lists of proposed "admissions" and "deletions" from the forthcoming revision of the United States Pharmacœpia (tenth) have been published in the BULLETIN during the past two years. Additional titles have since been proposed for inclusion as follows:

Acetum scillæ.
Althæa.
*Ammonii salicylas.
*Bismuthi subsalicylas.
*Caffeina citrata.
*Calcii glycerophosphas.
Carbon tetrachloride.
Ceratum.
Ceratum cantharidis.
*Cimicifuga.
*Diacetylmorphinæ hydrochloridum.
Emplastrum belladonnæ.
Emplastrum cantharidis.
*Extractum cimicifugæ.
*Extractum malti.
Fluidextractum belladonnæ foliorum (new—not in U. S. P. IX. The Fluidextract of the root is also official).
*Fluidextractum sarsaparillæ.
Fluidextractum scillæ.
Fluidextractum uvæ ursi.
Ipomoea orizabensis (to replace Scammony).
Liquor zinci chloridi.
*Maltum.
Massa ferri carbonatis.
Pilulae phosphori.
Quinidinæ sulphas.
Quinine ethyl-carbonate ("Euquinine").
*Sarsaparilla.
Spiritus ætheris nitrosi.
*Syrupus sarsaparillæ compositus.
Terebenum.
Tinctura cantharidis.
Tinctura limonis corticis.
Tinctura lobeliæ.
Tinctura tolutana.
Tinctura valerianæ ammoniata.
Tinctura zingiberis.
Unguentum hydrargyri nitratis.

The following general articles will be included:

Aquæ.
Aquæ aromaticæ.
Decocta.
Extracta.
Fluidextracta.
Infusa.
Suppositoria.
Tincturæ.
Triturationes.

In the above list of admissions, there are a few titles marked with an asterisk which were reported as "deletions" in earlier lists but which have been admitted through the action of the referee committee on scope, after considering the comments received from those who objected to their deletion.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The following list consists of other titles, official in the United States Pharmacopœia IX, but not recommended for inclusion in the new Pharmacopœia:

Acidum oleicum.
Collodium cantharidatum.
Extractum aconiti.
Extractum gentianæ.
Extractum opii.
Fluidextractum aconiti.
Fuidextractum gentianæ.
Fluidextractum lobeliæ.
Fluidextractum mucis vomicæ.
Fluidextractum veratri viridis.
Linimentum terebinthinæ.
Liquor sodii glycerophosphatis.
Oleatum hydrargyri.
Oleoresina cubebæ.
Oleum sesami.
Opium deodoratum.
Pilulæ ferri iodidi.
Pilulæ rhei compositus.
Pulvis aromaticus.
Scammoniæ radix (replaced by Ipomœa orizabensis).
Serum antidiphthericum siccum.
Serum antitetanicum siccum.
Spiritus juniperi compositus.
Tinctura cannabis.
Tinctura cinnamomi.
Trochisci cubebæ.
Trochisci potassii chloratis.

The referee committee on scope have carefully considered every comment submitted, have rediscussed a number of titles, and voted to reverse the original decision on the titles indicated. Other titles are yet before them for final decision.

Dr. E. Fullerton Cook, the chairman of the committee of revision, 636 South Franklin Square, Philadelphia, Pa., invites comments on these additional lists.

PHLEBOTOMY IN THE MONASTERIES.

As reported in the British Medical Journal of October 27, 1923, "at the meeting of the section of the history of medicine of the Royal Society of Medicine held on October 17, Dom Louis Gougaud, O. S. B., made an interesting communication on phlebotomy in the monasteries. In mediæval times bloodletting was very common throughout the monastic houses, and nuns as well as monks were periodically bled. The frequency of this practice may have been due to the sedentary and unhealthy mode of life in the cells and cloisters, and to the need for an effective prophylactic against the temptations of the flesh. In some religious houses it was done monthly, except when a feast intervened; in others the monks were bled every six or seven weeks; in others three, four, or five times a year, according to the rule of the order. In particular the Canons Regular had fixed days for phlebotomy. Often the procedure was laid down with much precision with regard to place and time of day, the prayers and ritual to be observed, the person who should perform the operation, and even the costume to be worn by the patient. Bandages of special material were occasionally prescribed, and directions given for preliminary warming of the arm. Detailed instructions governed the patient's diet and regimen during the period of rest after phle-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

botomy, and his relief from the full rigour of monastic discipline. The mediæval chronicles examined by Dom Louis Gougaud indicate that this relaxation from discipline after bloodletting often succeeded in loosening the patient's tongue and sometimes led to unwonted confidences. Both the *Consuetudo* of St. Augustine's Canterbury, and that of the Augustinian priory at Barnwell, near Cambridge, throw much light on phlebotomy as performed in English religious houses in the Middle Ages. The records of the practice go back to the seventh century; the Venerable Bede (A. D. 674–735) left a treatise on bloodletting. By the tenth century periodical bleeding was definitely accepted as a monastic custom, and it prevailed for several hundreds of years afterwards."

A NEW METHOD OF TREATING SYPHILIS.

The Southern Medical Journal of November, 1923, comments editorially on some of the newer methods of treating syphilis, among which may be mentioned "stovarsol" (oxyaminophenylarsenic acid), which may be given by mouth instead of by hypodermic injection. As reported in the Annales de l'Institut Pasteur, Paris, Levaditi and his colleagues have made use of this new arsenical compound and have found it in animal experiments to cure quickly syphilitic affections. They demonstrated also that it possessed strong prophylactic effects against syphilis in rabbits exposed to infection by the sexual route. Later experiments on human beings confirmed the results of animal tests. It was found in a carefully controlled case that if two grams of stovarsol were given by mouth within five hours after exposure to infection, no infection occurred.

Through the treatment of clinical syphilis by these French observers has thus far been limited, the results reported seem promising. They claim that in 30 cases the primary lesion was healed by stovarsol administration in from five to fourteen days. In secondary syphilis the therapeutic effects were also prompt and favorable; the skin eruptions disappeared after a short period of treatment. Tertiary lesions also have yielded promptly to treatment with stovarsol.

In administering the new drug tablets are used, each containing 0.25 grams, giving 1 gram per day every other day until from 12 to 16 grams have been administered in the course of a month.

It would be unwise to arrive at the conclusion that we have in this new preparation a thoroughly satisfactory method of treating syphilis by means of a drug administered by mouth. However, since the report of the observations emanates from the Pasteur Institute, it would seem to deserve serious consideration and to merit careful testing in organized clinics.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Marchoux (Bull. Soc. Path. Exot., May 9, 1923) reported success with daily doses of 0.25 grams of stovarsol in the treatment giardia infection and in amebic dysentery.

OPERATING-ROOM LIGHTING.

In the Stadtisch Krankenhaus, located in the free city of Danzig, one of the operating units is equipped with a novel artificial lighting apparatus. The source of the light is a powerful searchlight, situated outside the operating room, which sends its rays in through a glass window. The rays are directed toward seven circular glass mirrors arranged at different angles, which reflect the rays to six mirrors suspended from the ceiling; these mirrors in turn reflect the rays to the operating table and the immediate vicinity about it, producing a splendid lighting effect. The system is an enlargement of the idea made use of in the "Shamberg" dental lighting fixture.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS.

NURSING IN THE PHILIPPINE ISLANDS.

When nurses begin to weep for more worlds to conquer it would seem that the Philippine Islands would offer scope for the activities of earnest workers for some years to come. In 1921 it was estimated that there was one graduate nurse for every 13,000 persons in the islands—surely enough to keep her very busy! The Filipino women are rising to the situation splendidly, but when we consider that there are only thirty-odd hospitals in the islands and that only 11 of these have training schools, with about 700 nurses in training, it is easy to see that it will be some time before the supply is adequate to the demand.

It was naturally to be expected that when General Wood, trained in tropical hygiene and sanitation and with his excellent record in Cuba and elsewhere, was appointed Governor General, much attention would be paid to public health, and this expectation has in no wise been disappointing. It is chiefly through his efforts that the Rockefeller Foundation was induced to extend its work here. Other agencies are the public-welfare commission, health centers under the Government health service, and the Red Cross, all of which cooperate.

As always in public-health work, the public-health nurse is an important factor, and the hospitals can not turn them out fast enough. There is an excellent course in public-health nursing at the University of the Philippines, the second term of which began May 15, 1923. Sixty-five nurses entered this term and it is hoped that there may be an increased accommodation for the next class. In this course nurses get theoretical instruction in the usual subjects and have practical work with the above-mentioned public-health activities. A particularly broad-minded feature is the taking of foreign students. "Special pains will be taken to give foreign students emphasized training in those branches which may be most useful to them on their return to their own country. This offer is made in order to give nurses from neighboring countries the opportunity to train in public-health nursing if such opportunities are not to be found in their own countries."

The Rockefeller Foundation provides scholarships for post graduate work for some nurses in schools in the United States and the Government has a fund for *pensionados*, some of whom are nurses.

The training school of the Philippine General Hospital, an institution of over 600 beds, is under the auspices of the university. It is

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

delightful to see the spirit of earnestness and enthusiasm among the nurses there. For the past seven years this institution has been entirely under Filipino management, although American physicians take their patients there and American nurses may be called on special duty. The requirements for entrance to the training school are a minimum age limit of 18 years and one year of high school. The nurses have a beautiful home, built with high ceilings and wide-open ventilation, as is suitable in a tropical climate. The pupil nurses sleep in dormitories but the graduate nurses have their rooms. The nurses have an eight-hour duty, a physical directress, a very creditable library for which they themselves have bought most of the books, a fine large sitting room, well-equipped classrooms—in short, the same things which are being provided for nurses in American schools. There are some 300 pupils, about one-third of whom are male. This seems a large number in proportion to the number of patients, but the service is a very active one and there is a large out-patient department, besides which the Government is desirous of giving the training to as many as possible because of the great need for graduates. There is a great demand for graduate male nurses in public-health work, as they can go to outlying districts where women could hardly go on account of poor transportation and lodging facilities. The women, however, also show courage and fortitude, going to far-away districts for periods of two or three years and having no communication by mail or otherwise with their homes during this time. Formerly the male nurses were given genito-urinary work at the same time that the female nurses were getting their obstetrics, but when the male graduates got out into the Provinces where there were no physicians available they were called upon to help in so many obstetrical cases that they began to ask to come back and get instruction on the subject; of course this was gladly given and it is now included in their curriculum.

The next largest training school is the St. Luke's Episcopal Mission, which has grown from a very small beginning to a school having 56 pupil nurses. It is soon to be enlarged by the opening of two more buildings, one for obstetrical cases and one for isolation. Here the training is in the hands of six American nurses who are doing a real missionary work in caring for the sick and teaching the Filipino girls at the same time.

Other hospitals in Manila are the San Lazaro, contagious; the San Juan de Dios and St. Paul, conducted by Spanish Sisters of charity; the Chinese General Hospital; and the Mary J. Johnston Methodist Episcopal Mission.

In the provinces the training schools are smaller; in some cases there is only one graduate nurse, so it may be imagined how varied

Digitized by Google Original from UNIVERSITY OF MICHIGAN

her duties are. These send their nurses to affiliate with the Philippine General, and all go to San Lazaro for their contagious work.

Then there is the Culion leper colony. On December 31, 1922, the population of this colony was 4,973. The results of the modern treatment of this disease are said to be very encouraging and the patients go there with good hopes of being restored to their homes. In April of each year, visitors' boats take the families of a number of the lepers to visit them.

All of the training schools have been standardized and an effort is being made to obtain reciprocity with American Associations by the Filipino Nurses' Association, which is a very active organization.

The Filipinos have many qualities which go to make good nurses. They are naturally quiet, gentle, and friendly, nonirritable, and inherently courteous. No doubt this urbanity of the Filipino people comes from their long association with the Spanish, and it is to be hoped that it will not be displaced by American hustling.

Governor General Wood seems to recognize the great value of nurses as educational agents and he even has a project on hand for opening a training school for Igorot girls. The Igorots are the least civilized of the tribes of Luzon and it is his idea that their confidence can be best gained through their own people. To quote from his address to the National Conference on Infant Mortality and Public Welfare: "The needless loss of life in the Philippines must be stopped. The percentage of infant mortality is one-third of all births, very much greater than it should be, very much greater than is necessary. * * * We need in our campaign money, better work, and more nurses. But we have only 920 graduate nurses. * * * I wish that there were 10 times more than the graduates we have. * * * Encourage the profession of nursing. * * * We need more doctors and more nurses to build up in the islands at once, organizations of women, or women's clubs, which will take up this matter. * * * God bless your efforts."

In closing, we will quote from the biennial report of the Mary J. Johnston Hospital as showing the spirit of these missionaries and some of their difficulties: "Disease and despair have come, and in the main have been vanquished; the hospital doors have ever been open to the needy, and the only card of entrance, so long as there is room, is: 'I am sick.' * * * There are so many silly and even harmful superstitions which we try to combat; these superstitions many times lead to such neglect as to sin away the day of grace in which a poor baby might be treated and saved; we had a poor little boy brought in with a terrible dropsy, and in talking about him with his mother we elicited the statement that it was a good sign on the days when his nose swelled, for on those days his father was sure to have great success at his occupation, gambling? Little Leonora was

Digitized by Google Original from UNIVERSITY OF MICHIGAN

brought in and promptly deserted by her mother; she is 8 years old and has tubercular glands of the neck; she did weigh 25 pounds, but now she weighs 26 after about a hundred days in the children's ward. * * * Many young mothers in their early twenties are so bowed down by illness, weakness, and neglect as to look middle aged; thin, starving, neglected little children are brought in arms, many of them hopeless. * * *

"The three years in the hospital, although busy and sometimes strenuous ones for the nurses, are happy, sheltered years, and many of the girls try very hard to take advantage of every opportunity to improve themselves; others are apparently content to remain mediocre; but all go out to such hard, responsible lives with so many temptations, we are anxious to pour into their lives the best that is in us, that they may go out not only equipped with their professional training, but that they may have the strength of character sufficient to safeguard them when they leave the protecting hospital roof."

COOPERATION WITH ALL DEPARTMENTS.

In order that the work of the hospitals will run smoothly and efficiently, it is necessary to have cooperation, not only in our own department, but with all departments. The following instance shows where a spirit of cooperation could be very helpful: A doctor, visiting one of the hospitals, noticed the dietitian watching the trays as they came back from the patients; upon asking her why she was watching them so closely, she replied that she wished to take note of what food was generally eaten, and what was left practically untouched, and in this way be able to eliminate waste by observing the taste of the majority, also to ascertain if the uneaten food were bad or had been improperly prepared. The doctor said, "I know why those peas were not eaten; they are as hard as bullets." She inquired what to do to avoid repetition of this waste and he told her to take the matter up with the commissary officer. In this way, the attention of the purchasing officer was called to the necessity of investigating the nature of tinned goods before they are used. In many instances, a great deal of needless waste may be eliminated by such investigations.

This is but one instance where a little cooperation between two departments brought about a benefit to many, and at all times the willingness on the part of the nurses to cooperate with the heads of other departments will result in dispelling troubles and doubts which in time might grow to be quite serious.

Cooperate at all times and with all, and the result will be most satisfactory to yourself as well as to others.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

BOOK NOTICES.

Publishers submitting books for review are requested to address them as follows:

The Editor,
U. S. Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.

For review.

Books received for review will be returned in the absence of directions to the contrary.

HOSPITAL CORPS HANDBOOK, UNITED STATES NAVY, 1923. Published by the *Bureau of Medicine and Surgery under the authority of the Secretary of the Navy.* Government Printing Office, Washington, D. C., 1923.

This book presents in epitomized form certain subjects and facts which are of assistance to members of the Hospital Corps of the Navy in the performance of their duties ashore or afloat. It is compiled from articles prepared by members of the Medical, Hospital, and Nurse Corps of the Navy who have had special experience in the subjects about which they have written.

The volume opens with a brief sketch of the history of the Hospital Corps of the United States Navy whose ancestor by direct descent was the "loblolly boy," the individual who, as far back as the seventeenth century, was specifically detailed to assist the surgeon in the care of the sick and wounded on board British vessels of war.

This historical account is followed by carefully prepared and excellently illustrated chapters on anatomy and physiology, first aid and minor surgery, bandaging, dental first aid and nursing.

The chapter on nursing, prepared by three members of the Navy Nurse Corps, deals with the management and general supervision of wards in a naval hospital, general nursing procedures, the general principals governing the care of patients, surgical nursing, surgical dressings, and baths. This chapter includes an excellent presentation of the operating room and surgical technic use in the Navy, of anesthesia, physiotherapy, food, and dietetics.

In the Navy emphasis is placed on the prevention of disease; hence we find much space devoted to preventive medicine, hygiene and sanitation. This section contains succinct discussions of the communicable diseases, disinfection and disinfectants, maritime quarantine, air, ventilation, heat and housing, food and water and

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

their relation to health and disease, disposal of sewage and refuse, personal hygiene, vital statistics concerning the Navy, field sanitation, the venereal diseases, and embalming.

There are practical chapters on chemistry, pharmacy, materia and toxicology.

The chapter on bacteriology, blood work, and immunity outlines the principles involved, the general methods employed, and the practical application of the more common laboratory procedures. The animal parasites of man are described in an interesting manner.

There is a chapter devoted to a discussion of special activities which fall to the lot of the hospital corpsman and certain information which he should possess. In this chapter the hospital corpsman's duties when serving on independent duty, such as on destroyers, mine layers, mine sweepers, tugs, isolated radio stations to which no medical officer is attached, are considered. The hospital corpsman's duty with the warship's landing force, with a ship's shore patrol, and with expeditionary forces are indicated in a readable manner.

This chapter also contains discussions of such subjects as roentgenology, chemical warfare, deaths and medicolegal matters, recruiting.

The volume closes with a lengthy chapter on administration. In it we find a presentation of the general plan, arrangement, and management of naval hospitals, and the organization of the Navy with special reference to the medical department. Much space is properly devoted to a discussion of the clerical work in the medical department of the Navy in which is explained the method of correspondence, the use of the filing system adopted by the Bureau of Medicine and Surgery for use in all medical department activities, the use of blank forms and returns, the requisition and voucher forms employed, and accounting and property accountability.

An important portion of this chapter is that devoted to a discussion of the management of the commissary department at naval hospitals in which the preparation of menus in accordance with our present knowledge of food values is clearly explained. How provisions are procured in the Navy, how they are issued, the various standard cuts of meat, food inspection, stock keeping and accounting, and the duties of the commissary department personnel are all carefully considered.

From the foregoing account of the contents of this hand book one may see that the subject matter covers a wide field. The book is a splendid indication of the high educational standard set for the hospital corpsman by the medical department of the Navy.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A TREATISE ON ORTHOPAEDIC SURGERY, by *Royal Whitman, M. D., M. R. C. S., F. A. C. S., surgeon to the Hospital for Ruptured and Crippled, consulting orthopedic surgeon to the Hospital of St. John's Guild, to St. Agnes Hospital for Crippled and Atypical Children, White Plains, to the New York Home for Destitute Crippled Children, to the Darrach Home for Crippled Children, and to the New York State Board of Health.* Seventh edition. Lea and Febiger, Philadelphia, Pa., 1923.

During recent years much change has taken place in that special branch of medical science known as orthopedic surgery. It has developed by means of the ever-increasing application of surgical procedures to the many deformities of the body and defects in the locomotive function which were formerly regarded as hopeless or amenable to relief only by conservative treatment. It has become a specialty deservedly because of the time-consuming character of the work and because of the technical difficulties it involves.

The author of this volume, or the treatise itself, needs no introduction to the medical officers of the Navy, as the work long has been a standard guide of orthopedic practice.

In the present edition the selection of subjects and the space allotted to each have been determined primarily by their relative importance in the hospital service with which the author is connected, and it is interesting to note that about half of the volume is concerned with the treatment of those pathological conditions produced by the tubercle bacillus.

The author's material has been drawn from every department of medicine and it is assembled necessarily in groups unrelated in etiology and pathology. The only factor common to all is mechanical disability, the correction of which the writer presents in his well-known practical manner.

As the majority of orthopedic conditions are first encountered by the general practitioner, the author has carefully outlined the methods of systematic physical examination that lead to early diagnosis, and, by making clear the relation of causes to consequences, he indicates in natural sequence the principles of preventive treatment. In his extensive hospital practice certain procedures have become standardized. These are described in detail. The volume ends with a chapter on what the author calls "Collateral orthopaedics," which he has added to supplement the bibliographical, statistical, and clinical data that qualify the volume as a book of reference. This chapter deals mainly with military orthopedics and includes outlines for the treatment of fractures and nerve injuries, amputations and the adjustment of artificial limbs, and a discussion of the so-called "attitudes of election" or the standard position for each joint which best adapts the limb for functional usefulness when motion is lost or seriously impaired.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

MODERN ASPECTS OF THE CIRCULATION IN HEALTH AND DISEASE, by *Carl J. Wiggers, M. D., professor of physiology in the School of Medicine of Western Reserve University, Cleveland, Ohio.* Second edition. Lea & Febiger, Philadelphia, Pa., 1923.

Many phenomena of the circulation, normal and abnormal, remain undetected by our unaided senses, no matter how accurate our powers of observation may be. Therefore in late years various instrumental methods have been developed which supplement our direct observations either by recording the functions of the circulation graphically or by translating them into numerical terms which one may readily comprehend.

This book deals with the procedures by which the application of laboratory methods to the physical examination of the patient has led to the elucidation of many obscure conditions, to the recognition of new diseases, and to the institution of new forms of treatment. Eight years have passed since the first edition appeared, during which time many noteworthy contributions have been made to our knowledge of the circulation in health and disease and many of our earlier conceptions have become altered. In the present edition the author has not only included the advances made, but he has carefully evaluated the various phases of the subject, fitting in what is revolutionary in the new knowledge with that which we already know to be safe and conservative.

The subject matter is treated in three sections, the first of which represents to the reader the modern conception as to how the circulation is maintained in health, a matter of fundamental importance to a proper understanding of abnormal conditions. The second section deals with the various instruments and procedures which are available for studying the circulation of man, and in it the author places a correct valuation upon the different forms of apparatus and points out their limitations and errors. In the chapters comprising the third section the data obtained by experimental investigation of abnormal conditions in the laboratory has been correlated with the results derived from the application of instrumental methods at the bedside, relating these in turn with the simpler signs and symptoms displayed by the circulatory system.

The present edition contains new chapters on the efficiency and adaptability of the heart, vascular control of the circulation, principles and practice in the optical registration of mechanical pulsations in man, the functional disturbances of the heart, and the dynamic consequences of arrhythmias and chronic heart disease.

Among the important topics discussed in the second portion of the book are those relating to the arterial and venous pulse, to the electrocardiogram, to the investigation of heart sounds and murmurs by means of the phonocardiogram, to sphygmomanometry, the roentgenogram, and the orthodiagram.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

In the third section of the book the chapters on the diagnosis and significance of abnormal cardiac rhythms, the dynamic consequences of abnormal cardiac rhythms, the valvular lesions of the heart, and the dynamic consequences of chronic heart disease are especially instructive.

THE ELEMENTS OF PUBLIC HEALTH ADMINISTRATION, by *G. S. Luckett, A. B., M. D., director of public health, State of New Mexico; and H. F. Gray, B. S., M. S., Gr. P. H., chief, division of sanitary engineering and sanitation, New Mexico Bureau of Public Health.* P. Blakiston's Son & Co., Philadelphia, Pa., 1923.

The writers of this readable small volume state frankly that there is little that is new or unusual in the contents, the material being partly a condensation and combination of other textbooks and partly a presentation of the practical experiences of the authors, nevertheless they have produced a manual which meets a need especially in small communities. The book is an incident in the establishment by the authors of a new State health department in a region where no organized central health agency had previously existed. Among the many problems encountered during the development of this organization was that of instructing the newly appointed local part-time health officers in their duties. To furnish these men with a background of general principles "there was needed an elementary textbook on public-health administrative methods, a simple condensed summary that could be used as a ready reference by the practicing physician who was acting as health officer and who had no time to read the larger works."

As no textbook suitable for this purpose existed at the time the writers prepared a series of "lessons" with the object of telling the inexperienced health officers the "how" and "why" of their official duties in such a way that they could immediately apply this knowledge. The book is an outgrowth of these "lessons."

The material is treated in three parts the first of which deals with public-health administrative measures other than for communicable diseases; the second part concerns the preventable diseases, while the third the writers consider as an appendix in which they have placed a variety of unrelated useful data, such as a plan for county health work, a form of statistical report, instructions to public-health nurses, a plan of emergency organization for relief in epidemics, a course of instruction for midwives, a dairy score card and instructions for its use, a school chart of the common communicable diseases for the use of teachers, the technic of the Schick test, disinfection, delousing methods, and suggestions for various blank forms which have been found useful in small health departments.

The interest of this book to the naval medical officer will probably center in that portion which deals with administrative methods,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

although if he does not possess a good working knowledge of epidemiology much of value will be found in the section which concerns the preventable diseases.

In considering administrative methods the writers discuss in a very practical manner the relations of the health officer to the physician, the organization and functions of a local health department, finance and office management, registration of births and deaths, maternal, infant, and child hygiene, water supply, sewage disposal, wastes disposal, sanitation and housing, milk, food and food poisoning, education and publicity, public-health law, and the organization and functions of State and Federal health agencies.

Every health officer has to face two problems of the utmost importance. One is the obtaining of funds to carry on his work. The other is the management of these funds to secure the best results. Success in getting funds depends to a large measure on public opinion, and in the chapter on finance and management the authors make some pertinent remarks in connection with methods for creating a public opinion favorable to an adequate support of health work. However, the success of a health department depends not so much upon its financial resources and equipment as upon the character of the man at its head. His personality, intellectual make-up, and human understanding are the determining factors in organizing and popularizing his program. Among the characteristics that are found in the effective health officer the authors mention patience, tact, perception of the viewpoint and intelligence of those with whom he comes in contact, sincerity coupled with industry which create in the public mind the conviction that the health officer has the community good at heart, firmness and decision in carrying through a determined policy, thorough knowledge of his specialty, good judgment in dealing with questions of policy and administration, fairness to all, and courtesy always—truly an array of characteristics worth cultivating.

NERVOUS AND MENTAL RE-EDUCATION, by *Shepherd Ivory Franz, director of laboratories, St. Elizabeths Hospital (Government hospital for the insane), Washington, D. C.; professor of psychology, George Washington University.* The Macmillan Co., New York, 1923.

This book will, no doubt, be welcomed by those who have to do with the problems of readjustment of the individual, an inevitable result of the World War. The author endeavors to solve some of these problems, and to show medical men, not specialists, and also the laity the general principles and method of applying them in the neuroses and psychoses. There is a refreshing directness of style that renders the book attractive and instructive. The replacement of bad habits with better habits is the object of nervous and mental reeducation. The first two parts of the book discuss the formation

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of habits in the normal life of the individual and also the abnormal conditions of disease. Habits are classed as motor, sensory, and delayed reactions, and are acquired with different degrees of celerity, depending on the differences in kind. Usually the motor and sensory reactions follow the stimulus, but in the delayed reaction it does not do so immediately. When the adjustments are fine and numerous, the habit is only acquired after considerable practice. When the movements are gross and few the habits are learned quickly. The time element will vary with the individual as well as the kind of habit; also the delay of reaction will make a habit hard to form. From disuse a habit shows a loss in directness, fineness, or speed. Self-preservation and sex play important parts in education and also in reeducation. Hope and helpfulness are integral parts of rehabilitation and a "will to get well" must be created if it does not exist. This is especially true in the psychoses. Amusements, games, and friendships in hospitals are to be encouraged. Cooperation of patients, family, and the community are very necessary. All three kinds of habits are utilized in reeducation. Motor habits are concerned largely with paralysis, sensory habits with tabeties, and delayed reaction habits with aphasias. Analysis of movement show that the elements of strength, extent, and time are intimately related. An accurate movement is the adequate combination of all Any one element may be difficult and need reeducation. Previous tudies have overemphasized strength in comparison to extent of movement. The various types of "protractors" to measure "extent" are described by the author. The different spring dynamometers, commonly used to measure strength, are also discussed. The measurement of time of movements requires special apparatus which can only be used after practice. By means of "tapping movements" and a stop watch a fairly accurate determination of speed can be made. Various devices in reeducation are described for exercising the legs, hands, and arms. The author also utilizes all the applicable methods of electrotherapy, hydrotherapy, and physiotherapy, which he discusses as to relative value—kinesotherapy (active and passive movement, including massage) also has its uses in different cases. The dangers of overfatigue to weaken the muscles is warned against. The use of braces and casts must be left to the orthopedic surgeon but rigid splints are to be deprecated; whenever possible flexible splints should be used. The importance of records, especially moving pictures, to show progress, warrants the expense, and other records can be obtained by measurements or observation. These records are used not only to encourage the patient but are of importance in determining the continuance of treatment. There are two sources of error in these records,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

however, which must be considered, the first being error of observation of the instructor who records the measurement, and the second is the variability in the activity of the patient who may be able to do a little more or less at a given time. Both can be compensated for.

Part three of the book discusses in detail the application of the reeducational methods in neurological and mental cases, especially infantile paralysis, locomotor ataxia, cerebral paralysis, speech defects, and the psychotic. In this latter group are classed the neurasthenic, or psychosthenic, and the hysteric whose main manifestations are mental; also those who are commonly considered insane. In every case there is an outward expression of a so-called inward state, including motor and sensory disturbances. The normal habits are inefficient or there are perverted reactions. These patients do not respond to reeducation unless the "insight" is sufficient to recognize his abnormality. The desire to get well must also be present and sufficient confidence in himself and his physician to use every means at hand. Much more tact, patience, kindliness, and forbearance are required than in dealing with organic cases. On the other hand too much sympathy may cause him to exaggerate his condition. Suggestion in all its forms plays a large rôle in most of the reeducation procedures. A mental "catharsis" to rid himself of peculiar ideas that are burdens to him may necessitate disclosures and confidences, but extensive psychoanalytic measures need not be carried out. Well-known therapeutic measures, especially those directed toward the elimination of toxins, should be used. Electrotherapy must be cautiously applied in order that delusions or fears are not originated by the treatment. Currents with high voltage causing considerable skin pain have been found very useful, probably from their suggestion. Occupation therapy, such as mat making, basket weaving, raffia work, etc., may be of great value. It may be a means of preparation for future occupation in case the patient has to earn his own living, and is also an introduction to other occupations. Often the reverse of the patient's previous occupation will be necessary to maintain health, and these replacements are part of the reeducation.

ALCOHOL AND PROHIBITION IN THEIR RELATION TO CIVILIZATION AND THE ART OF LIVING, by *Victor G. Vecki, M. D.* J. P. Lippincott Co., Philadelphia, Pa., 1923.

The publisher's opinion of this book, as stated on the outside cover, is that it is "a fair and unprejudiced presentation of truths." The author evidently endeavors to be unbiased and fair, and succeeds fairly well in the first two chapters. The remainder of the book is a compilation of all that could be found to sustain the author's very evident antipathy to prohibition. It does not require the statement by himself of this fact in the chapter on "The medical profession"

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to convince the reader that the author is anti-Volstead. If one is looking for arguments against prohibition, this book will help him find evidence, but it is disappointing to those who are seeking a fair discussion for this very vital question of the day. The last chapter "What should be done" is a more reasonable discussion of both sides of the question. Sir James Crichton-Browne's statement is quoted: "That acquirement of *self-control* is one of the main objects of education, the exercise of it a chief part of the discipline of life, and to substitute for it grandmotherly legislation is to debilitate human nature and court disaster." Again he quotes from Monin: "Prohibition laws will be really effective when the desire for drink is subdued; and this can only be accomplished by individual social education."

The author believes the public school is the first place where the danger of alcoholic abuses must be impressed upon the child's mind, "but real facts, not exaggerations, must be taught." No doubt education has its value, but there is no evidence in the past or present to indicate that it is a solution of the problem. In presenting "real facts" it would be well also to bring out what the author omits in this book, the results of the eighteenth amendment in the reduction of crime, poverty, and disease, especially insanity, in various parts of the country. From equally reliable sources, such as the author quotes, there is abundant evidence to show the beneficial effect on the very ones that should be helped by this law, the "backbone of the country," the workman and laboring man. The abolition of the saloon, if for no other reason, should commend this law to the thoughtful man. By comparison to the pre-Volstead days, how often do we see drunken men in the streets and public places? The chronic alcoholic with bleary and watery eyes and injected nose so commonly seen in the past is now a curiosity. There is no doubt that the law is being defied secretly and openly, but for the most part by those who lead reckless lives without serious thought of law and order. If protective laws are ever just, surely one can find enough reasons for the Volstead law. In fact it was "self-protection" that caused so many Southern States to go "dry" before the eighteenth amendment was considered. It is only a further extension of these reasons that called for a constitutional amendment. Whether we believe that we, personally, need this protection is not the issue, any more than it is with many other protective laws that we acknowledge and obey. The question resolves itself into whether we, as loyal citizens of a country where majority rule is the accepted form of government, shall be law-abiding, even though it is contrary to one's personal belief. Defiance of one law is only a step to breaking others, and it is this factor that is considered the most deplorable feature of the attitude of many toward prohibition to-day.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Those of us who have been many years in the Navy remember the agitation when beer was taken away from the enlisted men, yet it was soon seen that a marked and beneficial change occurred. Again, in 1914 the abolition of the officers' wine messes aroused even greater resentment which continued for some time, yet it is believed that if both these questions were put to vote to-day that the officers and enlisted men would not wish to restore either the "canteen" or wine mess. As a reflection of the average community toward liquor and drugs it seems fair to compare the habits of the personnel of our Navy at the present time. Again for comparison we must go back a number of years, and by so doing it is safe to say there has never been a time when the Navy has consisted of so many clean-cut, self-controlled, fine types of manhood as it does to-day.

DISEASES OF THE SKIN, by *Frank Crozer Knowles, M. D., professor of dermatology, Jefferson Medical College; dermatologist to the Philadelphia General, the Presbyterian, the Children's and the Babies' Hospitals; chief of clinic, dermatological department, Pennsylvania Hospital.* Second edition. Lea & Febiger, Philadelphia, 1923.

This is a practical manual of diseases of the skin, of nearly 600 pages, which the author has revised considerably in the preparation of the present edition. The volume begins with a section devoted to a discussion of the anatomy and physiology of the skin, and the symptomatology, etiology, pathology, diagnosis, types, and the general principles of the treatment of skin diseases. A useful inclusion in this section is an outline of the regional distribution of the common skin diseases and the types of lesions tending to involve certain areas. The discussion of the special methods of treatment employed in the practice of dermatology is complete and embraces descriptions of the use of autoserum and foreign proteids, vaccine treatment, phototherapy (Finsen light and actinotherapy), radium treatment, X-ray therapy, fulguration, electrolysis, and refrigeration.

The writer has followed the usual practice in the preparation of textbooks on dermatology in that he has divided his subject matter into convenient classes. This classification includes 13 divisions as follows: Hyperemias, Inflammations, Hemorrhages, Hypertrophies, Anomalies of pigmentation, Atrophies, New growths, Neuroses, Diseases of the skin caused by vegetable organisms, Diseases caused by animal parasites, Diseases of the appendages, Diseases of the mucous membranes, and Acute eruptive fevers.

The description of each disease is short and clear, and the treatment recommended, as a rule, is that which the author has found to be most effective in his practice. As in most modern textbooks on dermatology, numerous carefully chosen illustrations are added to elucidate the author's text.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

RHUS DERMATITIS (POISON IVY), ITS PATHOLOGY AND CHEMOTHERAPY, by *James B. McNair.* The University of Chicago Press, Chicago, Ill., 1923.

This book is a very valuable contribution to medical literature on this subject and may well serve as a guide in the study of clinical cases as well as in the application of rational treatment to the condition. The specialist as well as the general practitioner will find food for thought in these pages.

The author gives a quite complete botanical description and comparison of plants under the general term of rhus diversiloba. He sets forth the technique of the numerous methods of experimentation and investigation whereby he arrives at his conclusions which seem well founded.

The "principal dermatitant" is given the name of lobinol and is considered, if pure and not a mixture, to contain "an unsaturated compound of the aromatic series containing carbon, hydrogen, and oxygen * * * and to be a poly-hydricphenol."

Several chapters are devoted to the pathology resulting from the irritant, a differential diagnosis, a discussion of the immunity to the dermatitis, and a very complete presentation of methods of treatment and remedies to be found in medical literature. An appendix of case histories descriptive of typical cases, symptoms, and the course of the skin manifestations is most instructive, and a bibliography of extraordinary length is to be found at the end of the book.

RUBBER AND GUTTA PERCHA INJECTIONS, by *Charles C. Miller, M. D.* Oak Printing & Publishing Co., Chicago, Ill., 1923.

This small book is a preliminary report of the use of rubber and gutta percha subcutaneously for the purpose of correcting various tissue deficiencies and facial deformities. By the use of excellent illustrations and short descriptive chapters, the author describes the types of material, method of preparation, and the special syringes required for this work.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE.

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge.

Notes on Preventive Medicine for Medical Officers, United States Navy.

ERADICATION OF VERMIN ON BOARD SHIP.

Vessels that have been in commission for some time are very likely to be infested with rats, bedbugs, and cockroaches.

The most practical method of attacking the vermin problem on board a large ship is by the organization of a sanitary squad. Such a squad should include a properly instructed hospital corpsman and two or three other men, one of whom, preferably, should be a carpenter's mate or other man sufficiently trained in the use of the necessary tools to get at places in which rats commonly build their nests, and to remove woodwork which conceals bedbugs and deposits of their eggs.

With a sanitary squad, efforts at eradication usually prove more or less fitful. In the absence of such a squad an order that bedbugs will not be tolerated on board at best accomplishes but little in the way of permanent relief. Such an order seldom reaches bugs in their innermost retreats. The truth is that rats and bedbugs come aboard from time to time; rats, over lines or gangways in spite of lights and sentries, and rat guards which are subject to disarrangement. Rats are also brought on board with provisions and other stores. Bedbugs are brought on board with more or less regularity while in port.

To one who is not fully informed it may appear a simple matter to free a ship of these pests. Such is not the case, and feverish activity over a brief period of time can not accomplish as much as calm and steady work by three men systematically employed every week in the year.

Unless such a squad is organized, the various divisions must be depended upon to look after their own parts of the ship. Generally, it becomes everybody's business to keep the ship free from vermin. It means that the first lieutenant and chief master-at-arms must continually keep after compartment cleaners, storeroom keepers, commissary force, messmen, mess attendants, etc. This may be a good plan in theory, but the tendency is for everybody's business to become nobody's business. In practice the work in different parts of the ship is not coordinated. Disinfestation does not proceed in

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

orderly fashion, but rather in spasmodic efforts from time to time to clean up this or that part of the ship. As indicated below, the distribution of vermin and the methods by which they spread from one part of the ship to another are such as to make efforts at eradication unsuccessful unless a logical plan of attack is adopted and executed systematically and continuously by a small group of men who understand the habits of rats and the insects to be exterminated, and who have been trained to make effective use of traps, chemical agents, and steam as required in practical disinfestation.

A workable scheme is to have a locker for the sanitary squad's gear in the vicinity of the sick bay. Tools, rat traps, spray guns, and adequate quantities of cresol, kerosene, turpentine, sodium fluoride, and other chemical agents, if employed, should be stowed here. Solutions may be prepared in large quantities in the dispensary. Materials should be issued by the first lieutenant's office somewhat in advance of needs. The medical officer should estimate the quantities of materials that will be required during the year in order to make certain that the supply officer or first lieutenant will have them in stock when required. It is particularly desirable to provide liberally for the replacement of rat traps and spray guns. The sanitary squad should work under the direction of the medical officer, but in the interests of cooperation the first lieutenant and chief master-at-arms should send work orders directly to the leading man of the squad. In practice any direct notification of the discovery of bedbugs in an officer's room or in the chief petty officers' quarters should secure immediate attention.

The hospital corpsman in charge of the squad should be required to keep a journal showing orders for work and work performed. The book, posted to date, should be kept on the medical officer's desk. Each day there should be entered the number of rats trapped and a brief account of work undertaken and accomplished the preceding day. The leading man should regularly inspect the laundry, crew's head, bathrooms, hammock nettings, pantries, and other places where cockroaches or bedbugs may be found. He should investigate locations where rats have been seen running in an effort to discover their breeding places. He should note the location and condition of receptacles for rubbish in living compartments and observe whether they are being emptied regularly and promptly so that rats will not have a supply of food in the form of remnants of articles purchased ashore or at the canteen. He should talk with compartment cleaners and teach them the best methods of destroying cockroaches and bedbugs, and learn from them whether any rats or insects have recently been seen in the compartment. Likewise, he should talk with storeroom keepers, cooks, bakers, and stewards and instruct them so that they may work effectively and furnish all necessary assistance.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

RATS.

There are several species of domestic rats; all introduced—none native to America. Order: Rodentia; genus, epimys. The most common in the United States are:

(1) *Mus musculus*, the common house mouse.
(2) *Epimys norvegicus*, the brown rat, sewer rat, gray rat, Norway rat (most numerous and widely distributed, except the mouse).
(3) *Epimys rattus*, the black rat.
(4) *Epimys alexandrinus*, the palm or roof rat.

The common brown rat is the most destructive. It has extended its range and steadily increased in numbers in spite of such attempts at extermination as have been made by man. It has supplanted and nearly exterminated the less robust black rat. Dominance is due to great fecundity and ability to adapt itself to all sorts of surroundings.

Breeding.—Mice and black rats produce smaller litters than the common sewer (brown) rat, but the period of gestation, about 21 days, and the number of litters, six or more per year, are the same for all species.

The brown rat produces from 6 to 12 or more young in a litter—average, 10. The females begin to breed when only three or four months old. At this rate, assuming that no deaths occur and that equal numbers of males and females are bred, one pair breeding uninterruptedly can produce in one year a posterity of more than 39,000 rats.

Habits.—Rats and mice are practically omnivorous. They feed upon all kinds of animal and vegetable matter. They are often cannibalistic. Rats travel extensively. They migrate from place to place in the same city and also follow routes of travel from city to city by way of freight cars or ships. Not infrequently they are found in boxes, crates, or packing cases.

The brown rat is a burrowing animal. It makes its home in the open field, in hedges, along river banks, in stone walls, piers, and in all kinds of buildings. This rat is a good swimmer and a good fighter, and will kill off the less ferocious black rats and palm rats in time. Both of the latter are good jumpers and climbers and are therefore found normally in the roofs of houses and in trees. The brown rat destroys grains while growing in the field and stores of grains in stock all along the line from producer to consumer; in the granary, mill, elevator, or ship's hold. It invades stores and warehouses and attacks dry provisions, fruits, vegetables, furs, laces, silks, carpets, and leather goods. It destroys eggs and young poultry. In general, it destroys by pollution ten times as much as it eats.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

It causes conflagrations by gnawing the insulation on electric conduits; floods, by gnawing lead pipes, and causes damage to foundations, embankments, floors, doors, and furnishings of dwellings.

The common house mouse does not confine its activities to the inside of buildings. It is often found in open fields. In warm climates the black rat and palm rat are able to maintain themselves against the brown rat by living in trees and other high places. These rats are frequently brought to our sea ports but seldom become very numerous.

Epidemiological considerations.—On board ship rats are always a potential menace to health. Bubonic plague is primarily a disease of the rat from which it is transmitted to man through the agency of the rat flea. The rat may also serve as the host for other parasites, such as *Trichinella spiralis*. An epizootic in rats precedes an epidemic of plague in man. The appearance of sick rats or the discovery of dead rats apart from a poisoning campaign should at once arouse suspicion that *B. pestis* has been introduced among the local rat population. All dead rats should then be examined for the morbid anatomy of plague, followed up with bacteriological examination in case suspicious lesions are found.

Disinfestation on board ship.—The object of a systematic and continuous campaign is to keep the rat population of the ship reduced to negligible numbers. Destruction of all rats is usually or nearly always out of the question. Even under favorable conditions, total extermination can scarcely be expected from fumigation with hydrocyanic acid gas, the most deadly fumigant.

The plan of attack should include:

(1) Invariable use of rat guards on all lines; lights and sentries at gangways.
(2) Rat proofing of store rooms, issue rooms, canteen, offices, and staterooms.
(3) The keeping of refuse, remnants, table leavings, and all articles or substances that may serve as food, away from the rats.
(4) Measures planned to destroy rats—
 (*a*) Trapping.
 (*b*) Rat hunting and destruction of nests.
 (*c*) Poisoning.
 (*d*) Fumigation with sulphur.

Measures to prevent rats from coming aboard.—Gangways are frequently left unprotected at night. Rats will not be deterred by a bright cargo light in the absence of a sentry. Rat guards are liable to become disarranged or bent. Not infrequently they are put on in such a way as to leave an opening along the line or a foothold that

Digitized by Google Original from UNIVERSITY OF MICHIGAN

will allow the rat to pass over the guard. The possibility of rat harborage should be borne in mind when crates of potatoes and large cases of provisions are brought on board.

Rat proofing.—Openings in meshed wire around piping and ventilation ducts leading into storerooms, issue rooms, bakeshop, offices, and staterooms, as well as closed spaces in which rats may build their nests undisturbed, should be closed with metal strips or by interweaving with heavy wire. When the mesh is coarse enough to permit rats to pass through, tight steel plates should be erected inside, or the openings should be reduced in size by weaving in heavy steel wire up to a point that is beyond jumping distance. These methods for closing openings are not altogether effective because rats on board ship learn to climb so well that they can make their way vertically up a comparatively smooth surface in a corner and they find no difficulty in climbing up an open meshed fencing. But, as a rule, if the rats have been gaining entrance to a room or space through openings around pipes the closing of those openings will keep them out.

Usually rats are not found in storerooms, or if they do gain access they do not find it possible to leave and return. Most storerooms below decks are rat proof because water-tight integrity must be maintained. Rats seldom enter while the doors are open because men are working in the room or in the passageway just outside.

Keeping food from rats.—Well-fed rats mature quickly, breed often, and have large litters. Poorly fed rats reproduce less frequently and have smaller litters. It is therefore of primary importance to starve the rats as much as possible by keeping all stores of foods protected against invasion and by destroying all refuse, table leavings, and remnants of articles purchased at the canteen, so that rats will not have access to them during the night or at any time in temporarily unoccupied rooms or spaces. Unless immediate or frequent removal and destruction is practiced, such articles should be collected in metal containers kept closed by tight fitting covers. To determine whether rats are present in unoccupied spaces an apple may be intentionally left here or there. Characteristic tooth marks will show that the apple has been gnawed. Rats will often eat soap; therefore supplies of soaps in storerooms and elsewhere should be protected.

DESTRUCTION OF RATS.

Trapping.—Rats are highly suspicious and cunning animals. This is especially true of rats dwelling on board a naval vessel, probably because they must exist and shift for themselves with human beings constantly near by. It is difficult to trap them, yet trapping persistently followed is the most effective way of destroying rats on board a battleship or other vessel of the Navy, because fumigation of the entire ship is ordinarily out of the question, and local fumigation is usually not worth while.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Comparatively few rats will be caught unless they can be deprived of food. Trapping is likely to result in almost complete failure when food is abundant. The cheap and common "guillotine" or spring trap is far and away superior to the cage trap for use on board ship; in fact where both types are employed it will usually be found that no rats are being caught in the cage traps, although consistently large daily catches continue with the spring traps. Guillotine traps made entirely of metal are supposed to be superior to those having a wooden base, but the latter properly handled and baited are effective.

A common mistake in trapping for rats is to use only a few traps when dozens are needed. Not less than 100 and preferably more traps should be kept baited and set at all times in a battleship when rats are known to be on board. House mice are less suspicious than rats and are much more easily trapped.

The traps must not be put out in trapping locations with any lingering rat smell or human smell about them. When they are brought in for rebaiting they should be cleansed by dipping in scalding hot water. The man who handles them should wear freshly washed rubber gloves. The last may be an unnecessary precaution, but it is not likely that a trap which has mangled a rat will catch another until it is entirely free from rat odor.

Cheese, preferably toasted, is probably the most convenient and satisfactory form of bait. The cheese should be cut into small cubes on a clean towel or sheet of muslin. Each cube should be enclosed in a single thickness of gauze to prevent the rat from getting it away from the holder without springing the trap. This is conveniently done by cutting the gauze into a small square, placing the cheese in the center, and tying the neck of the little sack so formed with a piece of thread. When this is secured to the bait holder it is almost impossible for a rat to get at the cheese without springing the guillotine. Another method of insuring release of the spring is to bend the end of the bait-holding wire around so that it points back towards the bar of the spring. Thus baited, the rat in working at the bait is likely to get his nose under the loop formed by bending the wire. If the bait is lifted the spring is released.

Small pieces of Vienna sausage (wienerwurst) or fried bacon are said to be excellent baits. Other baits recommended are oatmeal, fish, fish offal, fresh liver, raw meat, apples, carrots, corn, squash, or pumpkin seeds. Ripe tomatoes, green cucumbers, and other fresh vegetables are said to be very tempting to rats in winter.

Location of traps.—Rat runways suggest the numbers of traps to be used and the places where they may be placed to the best advantage. As a rule the trap should be placed where it can be left undisturbed for two or three days at a time. When the rats decrease in numbers as a result of successful trapping so that they are no longer observed

Digitized by Google Original from UNIVERSITY OF MICHIGAN

running about at night, traps should be set in all places where it is possible or likely that they will be caught, relocating them every few days. The number of traps in use should not be reduced as the daily catch falls off.

Destruction of nests.—Rats have been found to prefer such places on board ship in which to build their nests as spaces under transoms or built-in bunks, when there is a small opening around a pipe or in a corner through which they can gain access; in blower casings, air ducts, or even in large voice tubes. Any space ordinarily inaccessible to human beings that has a small opening or a devious path of approach may be selected as the home and breeding place by the rat family. As many nests as possible should be located by investigating openings and possible spaces behind sheathing, equipment, and furnishings, in compartments where rats are known to run. Favorite runways include overhead I beams, ventilation trunks and ducts, and any overhead piping along which the rats can travel through bulkheads. The closing of such openings puts the rats at a disadvantage and makes it more difficult for them to provide for their families. Destruction of the females and young in their nests is an important part of the campaign, inasmuch as it greatly limits the number of adults that would otherwise exist in the rat population a few months subsequently. This operates together with biological, disease-causing, nutritional, and environmental factors, and perhaps family and interfamily quarrels to limit the birth rate very definitely. There is, of course, a limit to the size of the rat population on board even in the absence of organized efforts to exterminate rats.

The simple smoke-producing apparatus sold for use in smoking out bees, when it is desired to drive them from one hive to another, may be used to good advantage at times to determine whether there are rats in certain concealed places without tearing down plating or furnishings. It consists of a bellows, burner, and delivery tube. A mixture of cotton and woolen rags, when burned, will give a dense smoke that will quickly drive the rats from their hiding places. The smoke may be pumped by the bellows through a flexible tube introduced through the suspected rat hole or opening. Wool and cotton smoke is more effective than sulphur fumes for this purpose.

Poisoning.—While the use of poison is the quickest way to get rid of rats and mice, the odor from the dead animals makes the method impracticable in occupied houses, and as a rule on board ship.

Poison should never be placed in open or unsheltered places. This applies particularly to strychnine and arsenic.

The principal poisons recommended for killing rats are barium carbonate, strychnine, arsenic, phosphorus, and squills (sea leek, *Scilla maritima*).

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Barium carbonate.—This agent is without taste or smell and it is one of the cheapest and most effective poisons for rats. In the small doses fed to rats it is harmless to domestic animals. It has a corrosive action on the mucous membrane of the stomach. It is a useful poison in buildings ashore because it acts slowly, and if exit is possible the rats usually leave the premises in search of water. Frequently, but not always, it may be used in dwelling houses without disagreeable consequences.

Barium carbonate may be fed in the form of dough composed of one part of the mineral and four parts of meal or flour. Ordinary oatmeal together with one-eighth of its bulk of barium carbonate may be mixed with water to form a fairly stiff dough. Sometimes the barium carbonate is spread upon fish or bread and butter, or upon moistened toast. The prepared bait should be placed in rat runs, about a teaspoonful at each place.

Strychnine.—The action of this drug is too rapid to make its use desirable in occupied houses; elsewhere it may be employed effectively. Dry crystals of strychnine sulphate or nitrate may be inserted in small pieces of meat, sausage, or toasted cheese, and placed in rat runs.

A sirup may be prepared to moisten oatmeal, wheat, or corn, by dissolving the strychnine in boiling water in the proportion of one ounce to the quart, adding an equal quantity of thick sugar sirup and stirring thoroughly. The grain to be used as bait should be soaked for several hours in the strychnine sirup.

Arsenic.—This is the most popular of the rat poisons. It is low in price, but measured by results obtained it is probably more costly than strychnine. It is said to be variable in its effects; if the rats survive a first dose it is very difficult to induce them to take another.

Powdered white arsenic (arsenous oxide, arsenous anhydride, arsenous acid) may be fed with any of the baits mentioned above.

Phosphorus.—The phosphorus pastes on the market are usually yellow phosphorus mixed with glucose and other substances, varying in proportion from one-fourth of 1 per cent to 4 per cent. The stronger mixtures are dangerously inflammable and the weaker mixtures are not effective. The popular belief that rats poisoned with phosphorus do not die on the premises is erroneous; likewise the belief that the bodies of rats killed with phosphorus dry up without giving off odors.

Squills.—One ounce of powdered squills may be mixed with 4 ounces of toasted cheese, or with butter and meal, and put in rat runs. The rats are said to eat it readily. It is rapid and deadly in its action. It is worthy of trial in places where the dead bodies of the rats will not create a nuisance.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Fumigation.—The objections against poisoning also apply to fumigation. The method is not generally applicable on board ship unless the dead rats can be found and removed. Fumigation of the holds in a cargo carrier is practicable; likewise fumigation of compartments that are likely to harbor rats in a passenger-carrying merchant ship. It is a different proposition with a battleship or other type of fighting ship. Unless all parts of the vessel are simultaneously disinfested a 90 per cent reduction in the rat population can not be expected. For effective fumigation it is necessary that all human beings leave the ship and that elaborate preparations be made in the way of opening up all spaces and moving stores, equipment, etc., in order that the gas may diffuse through all spaces and reach rats in their retreats.

Special circumstances may indicate limited fumigation but systematic trapping should make such measures unnecessary unless there is danger that bubonic plague may be introduced, and in that event the ship should be completely fumigated if possible.

Hydrocyanic acid gas is too dangerous to be used without the facilities of a quarantine station and the employment of trained personnel under the direction of an experienced medical officer to whom absolute authority is granted. Even under those conditions there would still be considerable danger of overlooking a few men who have not left the ship or have escaped notice and returned at the last moment to attend to some forgotten detail only to be overcome and killed before they can escape.

Sulphur dioxide is almost as effective as hydrocyanic acid gas with a sufficiently long period of exposure.

The fumigation standards adopted by the United States Public Health Service require the burning of 3 pounds of sulphur per 1,000 cubic feet of space with exposure for six hours in superstructure spaces, partially filled storerooms, and empty holds. For well-filled storerooms and compartments packed with materials the time of exposure should be doubled.

Rat viruses.—Neither the United States Public Health Service nor the Department of Agriculture recommends the use of any rat virus. No virus has been discovered that has uniformly high virulence which can be maintained. The virulence of cultures decreases with age, warm weather, and sunlight. Moreover, the effect depends not alone upon the virus but is essentially the result of biological reactions between the virus and the rats. If the infected rat is not killed, it is immunized. The establishment of mass immunity in the rat population makes the particular virus useless after a short time. The infections are not very communicable and do not spread to any great extent by contact of diseased with healthy rats.

A few reports of the effective use of rat virus on board ships of the Navy have been received, but it is to be borne in mind that any

Digitized by Google Original from UNIVERSITY OF MICHIGAN

intensive campaign against rats on board ship, whether by simple trapping or poisoning, for a short time will result in a temporary reduction of the rat population so that survivors will seldom be seen at large and it may be prematurely concluded that rats have been gotten rid of unless systematic trapping is carried on. The use of virus must be followed up with continuous trapping. Therefore little is gained because the early and striking reduction in a large rat population can be secured with an adequate number of traps as well as by the use of a virus, or, for that matter, by any of the simple poisons.

THE BEDBUG.

This insect may gain access to a dwelling house, hotel, or ship in spite of all reasonable precautions. It gets into trunks, suit cases, and satchels of travelers; into packages or baskets of laundry; and into clothing while being worn. Bedbugs have been brought on board ship along with a considerable variety of articles, including rolled up newspapers.

The bedbug is quite capable of migrating from house to house on its own legs. They will often continue to come from an adjoining house, sometimes for a period of several months, gaining entrance daily, especially if their original home is left vacant so that they are deprived of their usual source of food. They are able to make their way along walls, water pipes, and gutters, and gain entrance through windows or cracks. On board ship at times they migrate by their own powers of locomotion to a considerable extent across the ship, into adjoining compartments, or from one stateroom to another. In other instances they seem to have little tendency to migrate; staterooms on both sides of an infested room may remain free from the bugs for long periods.

It is not a disgrace to be visited by bedbugs, but failure on the part of anyone to institute immediate efforts toward eradication indicates a lack of common sense or a mistaken sense of shame. Failure to notify the medical officer frankly and at once when bedbugs are discovered is to be condemned on the grounds of sanitation.

The bedbug appears to have had its characteristics since the beginning of recorded history and has accompanied man wherever he has gone.

Order: Rhynchota (*Hemiptera*). To this order also belong the "blood-sucking cone nose" *Triatoma* (Conorrhinus), a winged member of the order, the suctorial lice and the bird lice. This order includes the true bugs, piercing insects characterized by possessing a piercing and sucking beak. Like nearly all the insects that are parasites of animals it is degraded structurally, its slight necessity for extensive locomotion have resulted in the loss of wings in the course of evolution.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Designated "Cimex" by the Romans, the common bedbug belongs to the genus known in recent years as Acanthia but now definitely renamed Cimex. It is a semiparasitic insect. Several species of this genus have been described, two of which, the common bedbug (*Cimex lectularus*) and the Indian bedbug (*Cimex rotundatus*), are parasites of man. Other species have been described; namely, *Cimex hirundinis*, which attacks swallows; *Cimex columbarius*, which attacks pigeons; and the *Cimex pinistrelli*, which is found on bats.

Characteristics.—Before feeding, the adult is much flattened, oval, rust red in color, and the abdomen is more or less tinged with black. When the body is flattened, it can pass into the smallest crack. When engorged, the body becomes much bloated and elongated as well as brightly colored from the ingested blood.

The wings are represented by the merest rudiments, barely recognizable pads. The bedbug has two compound eyes but the additional simple eyes of most true bugs are lacking. The antennæ are four-jointed. The proboscis is long and stout, and while at rest is carried under the ventral surface.

Ordinarily it does not feed on the hairy parts of the body, as it is not adapted to making its way through the hairs.

A characteristic feature is the familiar and disagreeable "buggy" odor. This very distinct odor is not limited to the bedbug but is characteristic of most plant bugs also, including the common chinch bug that affects small grains and the squash bug, all of which possess the odor, and it is quite as pungent with these plant-feeding forms as with the human parasite. The odor is a fortunate characteristic as it is of considerable assistance in detecting the presence of bedbugs. It comes from glands, situated in various parts of the body, which secrete a clear, oily volatile liquid. Although the odor is a means of protection of the true bugs against their enemies, which are kept away by it, the cockroach, which sometimes feeds on bedbugs, is evidently not deterred by it.

Habits.—The bedbug, normally nocturnal in habits, displays a marked degree of caution and intelligence in keeping itself hidden during the day. When very hungry, it will come out into the open in a well-lighted room at night, and it has been known to attack human beings in broad daylight under stress of hunger. As soon as it becomes engorged it leaves its victim at once and retires to its place of concealment—cracks in a wooden bedstead, inside spiral springs, inside tubular piping of bunk frames, in lockers, wardrobes, behind drawers of furniture, under the metal straps of trunks, behind wainscoting, under loose wall paper, in cracks behind mop boards, or any other likely place that offers security. In such places it manifests gregarious habit by collecting in masses.

The inherited experiences of many centuries of association with man, during which it has always found its host an active enemy, has

Digitized by Google Original from UNIVERSITY OF MICHIGAN

resulted in an intimate knowledge of the habits of man and led to craftiness, as exemplified by its habit, not infrequently observed, of leaving the bed entirely and going to distant quarters for hiding during daylight hours.

Life history.—The eggs are oval, white, or grayish bodies with a rim or lidlike top at one of the ends—a small projecting rim. The eggs are deposited in batches of from 6 to 50 in the cracks and crevices where the bugs go for concealment. In the case of females under observation, eggs are deposited almost daily for a period of two months or longer, at the rate of from 1 to 5 eggs a day. Sometimes larger hatches are laid. As many as 190 eggs have been obtained from a single captive female.

The eggs hatch in from 7 to 10 days in the hot weather of midsummer. Longer periods are required in cold weather. Cold may check development altogether. The young escape by pushing up the lidlike top with its projecting rim. At first they are yellowish white and nearly transparent. The young closely resemble the adult forms except that they are pale in color and the various regions of the body differ in proportions. Metamorphosis is incomplete, in that distinct larval and pupal stages are absent. The young grow to adult form normally through five successive moltings, or shedding of the skin, the color becoming darker and darker until fully grown. With the last molt the minute wing pads, characteristic of the adult insect, make their appearance.

The life cycle is subject to great variation depending upon temperature and food supply. In warm weather, with food available, there is ordinarily an average period of 8 days between moltings. About 8 days are also required in warm weather for the egg to hatch, so that a period of about 7 weeks is required from the time the egg is deposited to maturity of the adult insect. They are capable of living for a long period of time, a year or longer, without food in any stage of development. Molting periods are usually shorter in the earlier stages and lengthen in the later stages. Without food the bedbug may remain unchanged in any of the immature stages for an indefinite time, and such checking of development by starvation may result in additional molting periods. If the insect feeds but once between molts, it must puncture its host five times before becoming mature, and at least once afterwards before development of eggs. Additional meals may be taken between molts under favorable circumstances. The bug devotes from 5 to 10 minutes to sucking its fill of blood when undisturbed, and it then retires to its place of concealment for a period of 6 to 10 days for peaceful digestion of its enormous meal and subsequent molting, or reproduction if it has reached the adult stage.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

With reasonable allowances for lack of food and unfavorable temperature the expectation is that there will be at least four successive broods during the course of a year in an occupied ship or house that is kept well heated in winter.

Influence of temperature.—Eggs and newly hatched larvæ do not survive a temperature below freezing for a period longer than from two to four weeks. At temperatures below 60° F. the insect remains quiescent and in semihibernation. The temperature range favorable for activity is between 60° and 98° F. Therefore the bedbug will remain active in heated houses or ships during the winter. It is most active at temperatures between 60° and 75 °F. In a temperature of 96° to 100° F. with high relative humidity, newly hatched bedbugs die within a few days. If the temperature is raised to 113° F. they will be killed in a few minutes. This temperature also destroys the eggs. The relative humidity is of little importance at temperature higher than 113° F., dry heat having an equally prompt lethal effect.

The bite of the bedbug.—The majority of persons are sufficiently sensitive to bedbug bites so that the presence of the bugs is sufficient to make sleep and rest impossible. Considerable swelling and inflammation, lasting for several days, occurs at the site of the bite in some individuals. However, many persons are not troubled at all by bedbugs, and their presence may be overlooked unless stains that result occasionally from the accidental crushing of an engorged bug are found on the bed linen.

The bedbug does not seem to secrete any special poisonous substance and the inflammation that occurs in the case of a sensitive person probably results from the traumatism caused by the sharp serated piercing elements of the mouth parts.

Epidemiology.—The bedbug is believed by some to be responsible for the transmission of Kala-azar. It has been incriminated in connection with European and African relapsing fever, Chagas fever of Brazil, tropical sore, plague, and leprosy. The bedbug has been instrumental in carrying plague bacilli direct from man to man in certain circumscribed outbreaks of bubonic plague. Because of its limited range of movement it is not likely to give rise to widespread epidemics of any of the diseases in which it is a potential carrier; that is, the possibilities of dissemination are not anything like as great as with arthropod vectors whose habits are more migratory, such as ticks, fleas, and mosquitoes.

In the diseases mentioned, the bedbug, when it is a vector, shares responsibility for spreading the disease with other bloodsucking arthropods such as body lice and fleas. When disease is transferred by the bedbug, successful inoculation is probably due to accidental carriage of the causative agent on the mouth parts.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ERADICATION OF BEDBUGS.

As in the case of the rat, the best possible results in a campaign against bedbugs are not likely to be obtained without continued employment of a small but efficient sanitary squad. The job can never be considered as finished because of the importation of bugs from time to time.

General measures.—Frequent or weekly inspections should be made of places where bedbugs are likely to be harbored. Careful and regular inspections should be made to detect bedbugs in the ship's laundry, chief petty officers' quarters, sick bay, first lieutenant's storeroom, transoms in the wardroom, cabins, and other messrooms, lockers or other places in which life preservers are stowed, cushions of motor boats, hammock nettings, and offices in which men sleep.

A member of the sanitary squad should be present every week if practicable while dirty clothes are being received in the laundry. In any case the laundry men should watch carefully and report the sources from which bedbugs are received. Every week after the laundered articles have been distributed, the shelving and lockers should be inspected and flooded with live steam from a hose if the laundry is under suspicion as a distributing center, which almost inevitably it will be if there are bugs on board.

Reports of the discovery of bedbugs in staterooms, chief petty officers' quarters, or elsewhere should be followed up at once. In the case of an infested room a careful daily inspection should be made of the bunk and bedding, particularly of pipe frames, springs, seams and tufting of mattresses, and all cracks and crevices about the bunk, by the officer concerned. As a rule the bugs do not penetrate kapok mattresses and pillows. They are more likely to breed in hair mattresses because of the open spaces in the comparatively loose hair. It is usually possible to exterminate the bugs in any given room in one week at the most by the thorough application of a cresol-kerosene mixture, repeated once during the week.

In the case of an officer's room, one or two members of the sanitary squad should go into the room as soon as the officer or the mess attendant who takes care of the room reports that it is infested. The room boy should be present to look after clothing and give all necessary assistance. Woodwork around the bunk should be removed, and spaces under the bunk, behind furniture, and around drawers in the desk and bureau should be opened up. Disinfestant solution should be painted thoroughly and freely into all cracks and openings. The mattress and pillow should be taken up on deck and dosed thoroughly with cresol-kerosene mixture if they can not be subjected to heat in a disinfector or steaming room. They should be dried by several hours' exposure to fresh air and sunlight. It is well to treat the mattress and pillow, although failure to exterminate the bugs by

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the first attempt at disinfestation is much more likely to result, because all insects and eggs have not been destroyed in some place of concealment around the bunk or elsewhere in the room or in an adjoining room rather than because they were overlooked in the mattress or pillow.

The bunk spring should be disinfested with particular care. It is well to dose it thoroughly with cresol and kerosene, pouring the mixture into the piping if there are any holes. Then it should be exposed to heat if a wash room or other small room that can be flooded with steam is available where a temperature above 120° F. can be maintained for an hour or more. It is worth while to make such a room available if several bunks are to be disinfested at the same time. However, thorough application of cresol and kerosene alone is usually effective. The blowtorch may be used, but the flame damages the finish, and a great deal of time is required to make certain that all parts of the spring have been heated to a killing temperature. A canvas-bag disinfector such as that described below should prove most useful.

Usually the chief petty officers' quarters present the most difficult problem to solve in connection with the extermination of bedbugs on board ship. There are several reasons for this. In the first place they are usually overcrowded, and a considerable number up to 70 or more occupy the same room. They have more clothing to stow away than the bluejackets and often they are permitted to keep suit cases in quarters. Bedbugs find places of concealment in these and in and about lockers, as well as in bunk frames. The suit cases can be taken care of by regular inspections, so it is not altogether necessary that the men be deprived of this privilege, but such articles must be kept in mind. Some of the chief petty officers are sensitive to bedbugs and some are not. Too often the former are at the mercy of the latter, who cannot be expected to take as much interest in efforts to get rid of the bugs as those who are deprived of rest and sleep.

There is but one way to handle the situation effectively and that is to put a sanitary squad into these quarters and clean up the entire compartment in a single day. The chief petty officers should help, but if the job is left to them it will not be done thoroughly. Some will not take enough interest in the matter to go over their bunks and effects thoroughly; many will be on watch at the time they are needed, and a few will have been shipmates with bedbugs so often or so long that they have reached a belief that it is impossible to get rid of them. So what is the use of trying?

If bugs or eggs are left in some of the bunks or in some of the lockers, they will be widely distributed again throughout the quarters in the course of a few weeks.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Very likely more bugs will be brought on board during liberty and leave periods, and it will be necessary in any case to disinfest these quarters from time to time, but that is no reason for not making a thorough clean-up each time. The comfort of those who can not rest when bugs are present demands that much consideration. It is also very important to stop the transfer of bedbugs from the chief petty officers' quarters to the laundry, whence they are likely to be distributed to the sick bay and officers' rooms.

While the compartment is being disinfected it is preferable that all removable bunk springs and mattresses be removed to the upper deck for thorough treatment and prolonged sunning. Suit cases and bags should also be removed for careful inspection and treatment. Every locker in the room should receive attention. If the work is thoroughly done no complaints of bedbugs will be heard for several weeks at least. It is desirable, of course, that disinfestation be repeated once within a week in warm weather.

Heat.—If practicable, mattresses and pillows may be exposed to steam in a steam disinfector or flooded with steam in a canvas bag closed to confine the steam, or placed on a grating and sprayed with steam in some space where a steam hose can be used. In view of the bedbug's habits it is more important to apply heat to the bunk springs and piping than it is to steam the mattress. It is more important to heat hair mattresses than kapok mattresses. Steam flowing from a hose in the open air is not likely to heat the interior of the mattress.

To kill the bugs and eggs it is merely necessary that they be actually exposed to a temperature above 113° F. for a few minutes. It has been found practicable to raise the temperature of an entire house in the summer to 160° F. by shutting all doors and windows and making up a good fire in the furnace. It is comparatively easy to maintain a temperature between 120° and 130° F. for several hours, and thus destroy all bedbugs and eggs in the house. It is often possible on board ship to find a space where mattresses and bunk frames can be exposed for several hours to the necessary degree of heat, either in a washroom which may be closed and heated by flooding with steam or in an engine room or fireroom space that is naturally hot. At times exposure in the middle of the day to the radiant heat of the sun may raise the temperature of metal parts to the thermal death point. Prolonged, frequently repeated sunning is a good general measure in any case.

Heating the metal bunk frame, springs, and piping by means of the gasoline torch is effective provided the flame is applied long enough and with sufficient care to heat all parts to the required temperature. If there are holes in the tubing it will generally be found that such bunk frames are favorite hiding places for bugs.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Bureau of Construction and Repair specifications now require that the tubing of bunk frames shall have no perforations through which bedbugs can gain access to the interior. Some of the older ships still have frames that are not bedbug proof. Steps should be taken by such ships to obtain bunks of approved design for the sick bay and chief petty officers' quarters.

Scalding hot water can sometimes be employed where it is impracticable to use a steam hose. Ashore, hot water may be poured over beds and into accessible cracks.

It should be practicable to construct a bag disinfector on board ship of heavy canvas into which either a mattress or a bunk spring can be put and the bag hung up. The upper end should be closed permanently by sewing. There should be a small opening at the top for the introduction of the nozzle or end of a steam hose. The lower end should have grommets so that it can be closed tight enough to confine the steam partially at least. Such a simple type of portable steam disinfector was described in detail by Lieut. Commander R. F. Jones, Medical Corps, United States Navy, and Lieut. P. Richmond, Medical Corps, United States Navy, in the September, 1922, number of this BULLETIN. They tested the "sack" steam disinfector invented by Col. P. S. Lelian, R. A. M. C., and found that when low-pressure steam was introduced through the steam hose that cultures of *B. coli*, staphylococci, and bedbugs were killed within 15 minutes after steam began to flow freely from the partially closed lower end of the sack. The steam was taken from a steam line in which the pressure was approximately 5 pounds per square inch. Hotter steam (10 to 25 pounds' pressure) is almost always available. It required about 20 minutes to get a full flow of steam through the mouth of the sack. Hence, 35 minutes should be allowed for sure destruction of bedbugs and their eggs. Such a bag should be highly effective against bedbugs in view of the comparatively low temperature required to destroy them—113° to 120° F.

Fumigation.—This is a quick and effective method of disinfecting a room or entire building, compartments on board ship or the entire ship if circumstances make fumigation practicable and desirable. Ordinarily fumigation is not indicated because the bugs can be gotten rid of by less disagreeable means.

Hydrocyanic-acid gas is the most effective fumigant, but can not be used in an occupied vessel.

Sulphur may be used without danger and to good advantage in the case of a room that can be sealed up without much trouble provided it is so located that escaping fumes will not be objectionable. If it is considered advisable to fumigate, it is worth while to use a concentrated gas. Therefore, 3 pounds of sulphur per 1,000 cubic feet should be burned. Smaller amounts are sometimes recommended. The exposure period should be at least six hours.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Mattresses and bedding should be hung up in the room; lockers should be opened; bureau drawers pulled out; furniture moved; and other arrangements made that will insure free circulation of the gas to all cracks and crevices. Ports should be tightly closed. Holes in bulkheads and cracks around doors should be sealed. Sulphur-dioxide fumes destroy the insect in all stages, including the egg. Other gases and vapors are of little value.

Chemical agents.—Powders are of little value because of the difficulty of getting them into crevices and places where the bugs conceal themselves. A not uncommon source of annoyance to those engaged in a campaign for the extermination of bedbugs is the smart individual who has personally gotten rid of all bedbugs sometime or other by sprinkling some marvelous powder about—or perhaps it was some wonderful patented liquid preparation.

An effective and useful solution that may be prepared in large quantities is a mixture of kerosene and cresol with or without the addition of turpentine. So far as chemical agents are concerned this can well serve as the only solution used for the destruction of cockroaches as well as for the extermination of bedbugs. A mixture of 1 part of crude cresol to 9 parts of kerosene is effective. That is a 10 per cent cresol mixture. A 5 per cent mixture is often recommended. A 15 per cent mixture can ordinarily be used without damage to paint work, mattresses, and furniture. A strong mixture (10 per cent at least) is indicated against cockroaches; if weaker mixtures are used the cockroaches fall down when the spray hits them, but if left alone some of them eventually recover and scurry away. Instead of straight kerosene, 10 to 20 per cent of turpentine may be added to the kerosene before the cresol mixture is made. The odor is perhaps less disagreeable to most people with the turpentine added, and turpentine is in itself an effective agent against bedbugs.

The mixture should be used liberally. Walls, mattresses, and pillows may be sprayed, but the solution should be introduced freely into cracks by painting in with a flat varnish brush. It may be poured through piping and over bunk springs.

Corrosive sublimate is of value if a strong solution is used. The following solution has been used with apparent success:

	Ounces.
Sodium chloride	½
Bichloride of mercury	½
Water	2
Alcohol	2
Spirits of turpentine	6

This solution may be used on mattresses around the tufts and along seams. When large quantities are used the possibility that enough of the sublimate will volatilize at room temperature to cause symptoms of mercurial poisoning should be borne in mind.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

COCKROACHES.

Roaches are insects belonging to the order Orthoptera, the family Blattidæ. There are a number of genera coming within this family, the members of which are mostly wild. At least four species, however, have become domesticated and have been household pests for many hundreds of years; all are found in the United States. The domesticated species are as follows:

The oriental roach (*Blatta orientalis*). This is a common roach in Europe as well as in this country. It is a large species, very dark in color, and sometimes called in Europe the "black beetle."

The German roach, or Croton bug, a European species, small in size (*Blattella germanica*).

The Australian roach, a native of Australia (*Periplaneta australasiæ*).

The American roach of subtropical and tropical America (*Periplaneta americana*).

House roaches are brown or dark brown in color; the body is rather broad and flattened antero-posteriorly; the head is bent under the body and the mouth parts are directed backward, the eyes downward. The antennae are very long and slender. The insects have two pairs of wings, the outer pair being leathery. In some species the females are almost wingless, notably the oriental cockroach. The mouth parts are well developed and adapted to biting. Metamorphosis is incomplete. The eggs are not laid separately, but are gathered together within the abdomen and inclosed in a horny capsule, which is then deposited in dark cracks and crevices. When the eggs develop the capsule is split and the young emerge. The egg capsule is often carried by the mother until the eggs are about ready to hatch. Newly hatched insects resemble the adult forms very closely, and pass through a variable number of molts. It probably takes from six months to a year to reach full development, depending upon the species.

The Australian roach may be differentiated from the others by the brighter and more definitely limited yellow band on the back between the head and wings, and by the yellow markings on the sides of the upper wings.

Roaches of different species are rarely found together, although roaches of the same species live together on very amicable terms.

Ordinarily not more than one generation per year is produced. Reproduction occurs principally during the warm weather, as roaches are particularly sensitive to cold. The abundance of roaches is apparently not accounted for so much by rapidity of multiplication as by very unusual ability to preserve themselves from ordinary means of destruction.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The are nocturnal in habits and their numbers are often not realized unless they are surprised in their midnight feats. During the day they conceal themselves wherever protection from natural enemies and from light is afforded. Because of their shape they can squeeze into very small crevices. Occasionally they migrate, and this accounts in part for the way in which new houses and offices are invaded. They are also transported with supplies. When surprised, they seek shelter with a scurrying gait and usually escape.

They are practically omnivorous. The mouth parts and jaws are strong, enabling them to eat all sorts of substances—dead animal matter, cereals, and in fact any form of food material; woolens, leather, and cloth or leather bookbindings. Occasionally they turn cannibal. Probably dead roaches frequently disappear in this way.

Roaches by preference infest bakeries, kitchens, pantries, storerooms, and toilets. They follow water and drain pipes.

Roaches are a sanitary menace, because they are potential carriers of infection mechanically by means of their feet and bodies. They soil everything they come in contact with, leaving a nauseous, roachy odor.

The possibility of the transfer by cockroaches of microorganisms belonging to the meat poisoning group—*B. enteritidis* and others—from one contaminated piece of meat or other source to meat in storage or to food undergoing preparation for cooking, should be borne in mind.

DESTRUCTION OF COCKROACHES.

On board ship cockroaches are usually numerous and troublesome, the moisture and heat of the vessel being particularly favorable to their development. Total elimination of roaches is difficult. Scrupulous cleanliness and the keeping of food and food remnants in places and containers inaccessible to the roach is of prime importance. All corners, cracks, and imperfections in structure in storerooms, galleys, bake shops, pantries, hammock nettings, toilets, etc., which favor breeding or furnish hiding places must be eliminated or treated with roach poison. The chemical agents serve all practical purposes—sodium fluoride for use in powdered form and the cresol-kerosene antibedbug mixture for use in the spray gun.

It should be remembered that cockroaches are brought on board from time to time with stores. The logical place to begin the attack is in the various storerooms. Little headway can be made by spasmodic efforts to get rid of roaches in the galley, bakeship, pantries, etc., unless the storerooms are disinfested. Cooks, bakers, stewards, mess attendants, and compartment cleaners should, of course, be required to keep after the roaches in their spaces. But the sanitary squad should with the cooperation and assistance of storeroom keepers proceed against the insects in the storerooms.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The attack may well be opened with a heavy spray of the cresol-kerosene mixture. That usually brings to light more roaches than were thought to be in hiding. The spray is dangerous to them and they scurry from their places of concealment into the open where the spray can be driven directly upon them. Large numbers of roaches can be killed in a few minutes in that way.

Sodium fluoride should then be sprinkled about on the shelves, in corners, into cracks, and anywhere it appears likely the roaches will walk or climb. The powder should be sprinkled particularly in places where it can be left undisturbed for several weeks. It is too expensive to throw around where it will be swept up in a day or two. It acts slowly, as a rule. The roaches walk in it and then lick it from their feet, in this way it acts as a stomach poison which eventually kills.

According to the United States Department of Agriculture, Bulletin 658, on cockroaches, it is not definitely known whether the sodium fluoride acts through the breathing pores or as a stomach poison, but probably it acts in both ways, inasmuch as it has been found to kill caterpillars fed on foliage dusted with it. The Department of Agriculture recommends it as one of the most effective simple means of ridding premises of roaches. "Numerous practical tests have been conducted in lunch rooms, bakeries, milk-bottle exchanges, etc., and these have shown that with the use of this substance roaches can be completely exterminated in such places with very little trouble and cost."

The sodium fluoride may be blown over shelves and floors and into cracks by means of a powder blower or dust gun. It also has an immediate effect, causing many of the roaches to come out of their retreats and rush about more or less blindly, showing evidence of discomfort, to be followed in the course of a few hours by their death. Some consider the use of sodium fluoride in this way more effective than a spray of cresol-kerosene. The latter has the advantage in killing almost immediately and of being easier to handle as a spray. The former has the advantage of being the material that must be used as the final agent in either case, and if it is blown into places where it may be left for continuous action, the job is finished by the one operation.

Disinfestation is to be accomplished by the same means in all parts of the ship. The campaign resolves itself into an organized effort to go after the roaches wherever they are seen by means of the spray and by dusting the powder along shelves, behind dishes, books, etc.; in drawers of desks, tables, and lockers, and in spaces under the drawers; on overhead piping; along I beams; etc.

The sanitary squad should fill and issue spray guns and powder to compartment cleaners, stewards, cooks, and bakers, and see that

Digitized by Google Original from UNIVERSITY OF MICHIGAN

these men know how to make the most effective use of them. Places which are particularly subject to infestation, such as storerooms, galleys, issue room, bakeshop, and pantries should have their own spray guns ready for use when cockroaches are seen. Such places should be inspected occasionally at night when the roaches are likely to be out in numbers. Food may be left out to attract them. Spray guns should be ready so that when the light is turned on suddenly they may be killed by the spray before they can escape.

Large numbers may be destroyed in places heavily infested by means of traps. A simple form of trap consists of a deep smooth basin or jar, with a stick leading up to the top as a runway from which they slip into the trap. The trap may be baited with sweetened meal or other food material. However, little progress toward extermination can be made by such expedients on board ship, although they are of some value in buildings ashore.

Other chemical agents recommended for use against cockroaches include borax, sulphur, arsenic, and phosphorus.

Arsenic does very little good, as roaches are wary and shun the poisonous bait. Phosphorous paste, containing 1 or 2 per cent of phosphorus, has been used successfully in offices to free desks from cockroaches, but sodium fluoride powder is equally if not more effective. Borax is more or less repellant in action and somewhat poisonous. It enters into the composition of many of the so-called roach powders. Pyrethrum powder is at best only a temporary expedient. Sulphur is effective as a repellant.

Fumigation.—Sulphur-dioxide gas is of course effective against roaches, but it may not destroy the eggs.

Carbon-bisulphide fumes are effectively insecticidal, but the indications for its use are limited as it, like hydrocyanic-acid gas, is poisonous to human beings. Also, the vapor when concentrated is violently explosive in the presence of a fire.

In preparing the above paragraphs relating to rats, bedbugs, and cockroaches, the following articles published by the United States Department of Agriculture have been freely quoted:

Farmers' Bulletin 896, House Rats and Mice, by David E. Lantz, assistant biologist.

Farmers' Bulletin 754, The Bedbug, by C. L. Marlatt, entomologist and assistant chief of bureau.

Farmers' Bulletin 658, Cockroaches, by C. L. Marlatt.

SUPPLEMENTARY REPORT: REVIEW OF LITERATURE RELATING TO PROPHYLAXIS OF MEASLES.

By T. W. Kemmerer, M. D., Bacteriologist, Hygienic Laboratory, United States Public Health Service

The experience of Solomon (1923) is that the serum of adults is nearly as efficacious as that of convalescents. He was unable to obtain a sufficient quantity of convalescents' serum and was forced

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to use that of adults. There were 198 infants over 3 months of age in the hospitals who were exposed to measles. Sixty received no prophylactic serum; all developed measles and 35 (58.3 per cent) died. Sixty-two received convalescents' serum; 25 (40.3 per cent) developed measles, and 4 (16 per cent) died. Seventy-six received serum (10 to 15 c. c.) of adults who had had measles in childhood; 36 (47.4 per cent) developed measles and 5 (13.8 per cent) died.

There were 42 infants under 3 months of age of whom 14 developed measles in a light form.

The low percentage of protection afforded by convalescents' serum may be due to the fact that he was compelled to use the serum of infants, which perhaps does not contain as much antibody as that of older individuals.

Nicolle and Conseil in a recent publication (July, 1923) state that in their early researches, begun in 1911, they inoculated children with blood from monkeys sick with measles, the blood being either unmodified or modified by heat or otherwise. The resulting disease never exceeded in severity that of mild measles and they never noted any complications.

In the use of convalescents' serum, it is advisable to use a mixed serum and to inject at least 10 c. c. The duration of the immunity conferred by convalescents' serum does not exceed a few weeks. Serum kept on ice remains active for at least two years.

They have recently substituted serovaccination, which consists in successive inoculations of convalescents' serum (10 c. c.) and, 24 hours later, the blood of a measles patient (1 c. c.). The method is harmless and the immunity obtained is without doubt more lasting. They state that the period of contagion in measles coincides with the period of observable illness—from the beginning of the fever, before the eruption, to the day after the disappearance of the fever. The accepted opinion that measles is never contracted a second time is exaggerated. An individual who has recovered from measles may be reinoculated within two years or at any later time. The new attack is either typical or benign, or there may be a transient rise in temperature without an eruption. It is difficult to explain, with the conception of a lasting immunity in convalescents, the conservation of the virus in nature and the return of the epidemics. The supposition that there is a regular passage of the virus every 14 days at the farthest from sick children to new children fails. It is easy to comprehend the permanent conservation of the virus in our species after it is proven that convalescents from measles can contract a new infection. It is only the benignity of the attack which hinders the recognition of its nature. Certain transient colds are second attacks of attenuated contagious measles. They claim to be able to present evidence of the presence of the virus of measles in the blood of persons who have recovered and who have not received a new inoculation.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Savini (1923) uses a syringe containing a 5 per cent solution of sodium citrate to withdraw an equal quantity of blood from a measles patient. The mixture is then heated at 56° for 15 minutes.

A method which is equally good and is simpler is to add 1 per cent of phenol to the citrate solution, making the final phenol content of the mixture 0.5 per cent; 4 to 5 c. c. are injected subcutaneously morning and evening on three successive days; 1 to 2 c. c. is sufficient for an infant. The immunity obtained is very effective, since injection of virulent blood a week later will not produce infection. This is an active immunization and is superior to passive immunization in that it is more effective and lasting. The injection of the vaccine produced no local or general reaction. He has never observed anaphylaxis or hemolysis. The subject is not exposed to the danger of the specific infection nor to accidental infection (syphilis, malaria).

This method is also applicable as a prophylaxis against typhus and scarlet fever. His series of cases is rather small. He has immunized 30 against typhus, 36 against scarlet fever, and only 7 against measles.

Hermann (1923) presents further evidence that infants under 2 months of age of mothers who have had measles are immune; immunity becomes less marked as they grow older, but that even at 4 or 5 months of age only 25 per cent are infected. From this time on the relative immunity quickly diminishes so that infants over 9 months of age are as susceptible as older children. When young infants are infected with measles, the disease runs a mild course.

Ratnoff (1923) presents his personal experience in over a hundred cases immunized by convalescents' serum. There was not a single case of fully developed measles. In perhaps a fifth of the children there was some trifling phenomena, such as a faint scattered rash or slight rise of temperature.

BIBLIOGRAPHY.

Hermann, C.
1923. The relative immunity of infants under 5 months of age to infection with measles. Arch. Pediat. XL: 678–682.

Nicolle, C., and Conseil, E.
1923. Acquisitions nouvelles sur la rougeole. (Vaccination preventive. Conditions de la contagion.) Compt. rend. Acad. d. Sci. V. 171: 160–162.

Ratnoff, H. L.
1923. Serotherapy in measles. Arch. Pediat. XL: 683–691.

Savini, E.
1923. Essais de vaccinothérapie preventive dans le typhus exanthématique, la scarlatine, et al rougeole. Compt. rend. Soc. de biol. V. 89: 694–696.

Solomon, G.
1923. Die prophylaktische injektion von normalserum als masernschutz. Deutsch. med. Wchnschr. Jahr. 49: 1151–1152. (Ab. Brit. Med. Jour. V. 2, epitome 45–46.)

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

SWIMMING POOLS IN DETROIT—EPIDEMIOLOGICAL CONSIDERATIONS.

The following discussion relating to Detroit's swimming pools is of interest in connection with the problem of preventing the spread of disease in Navy swimming pools at naval training stations, Naval Academy, etc. The article is taken from the Weekly Health Review for weeks ending November 12 and November 17, 1923, published by the city of Detroit, department of health, and edited by Carl E. Buck, D. P. H., epidemiologist:

"Until comparatively recently swimming, with the exception of a few club and commercial pools, has been confined to the outdoors during the warm summer months. During the past few years, with the ever-broadening scope of education, with its inclusion of the physical along with the mental development of the child, schools have felt the need for swimming pools, with the result that swimming is fast becoming an all-the-year-round sport. It is the hope of the board of education to gradually increase its number of pools to the point where all school children may be required to learn to swim. At present there are in Detroit 21 swimming pools in daily operation, with a daily average attendance of upwards of 5,000. There are 4 club pools, 3 pools operated by the department recreation, and 14 school pools. Two additional school pools are to be opened in the very near future. School pools are used by the children during school hours. Very wisely the use of these pools has been continued on into the evening when, under the direction of the department of recreation, classes are held for adults.

"Knowing how to swim may at some time prove of very practical use to us. This combined with the fact that swimming is one of the very best possible forms of exercise and one which can be continued throughout life make the project of increasing our swimming facilities a most commendable one. It does, however, present a sanitary problem of considerable importance. We must see to it that we have clean bathers and clean water. With this object in view careful record has been kept of swimming-pool water as far as bacterial content is concerned.

"The following table gives the relative standing of each pool for the past year as computed from the bacterial content of the water:

74459—24——9

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Detroit swimming pools from November 1, 1922, to November 1, 1923.

Order of standing and pool.	Sample No.	Median bacterial count.	Presence of colon.				Type of treatment.
			Average number per 100 c. c.	Per cent of samples: More than 10 per 100 c.c.	Actual average colon count.	Daily attendance.	
1. D. A. C.	178	184	1.64	3.17	4.33	100	V. R., S. F.
2. McMicheal, girls'	125	1,372	1.58	1.36	2.85	125	Do.
3. Balch	115	2,868	1.32	1.54	2.75	375	Chl., S. F.
4. Y. M. C. A.	165	802	3.20	5.13	13.20	250	Do.
5. Cass	85	3,825	1.12	1.25	2.25	525	Chl., S. F.
6. Hutchins, girls'	113	1,335	2.15	6.63	15.08	225	V. R., S. F.
7. Barbour, boys'	97	4,437	2.80	.64	3.37	260	Do.
8. Hutchins, boys'	108	372	2.95	9.28	33.93	2[illegible]5	Do.
9. D. Y. C.	31	316	4.52	7.72	30.25	[illegible]	V. R., S. F
10. Northwestern	129	2,373	3.33	15.70	22.72	400	Do.
11. K. of C.	28	775	4.00	13.00	40.75	125	Emptied weekly.
12. Barbour, girls'	96	6,690	2.20	7.44	33.86	240	Chl., S. F.
13. McMicheal, boys'	116	3,331	4.13	11.58	13.90	220	V. R., S. F.
14. Northeastern	86	4,743	3.55	7.80	18.27	200	Emptied daily.
15. Elmwood	44	12,569	3.77	2.63	7.78	85	Do.
16. Southwestern	80	7,213	1.47	9.08	47.20	350	V. R., S. F.
17. Northern	111	4,518	3.73	9.87	28.65	400	Emptied daily.
18. Clara Arthur	68	14,877	3.59	5.88	8.84	80	Emptied.
19. Atkinson	90	12,886	3.04	10.05	13.20	200	V. R., S. F.
20. Central	76	5,196	3.41	11.76	47.72	450	Emptied daily.
21. Southeastern	94	8,116	4.30	12.30	23.98	450	Emptied twice a week.

"The standing of each pool has been determined by averaging its relative standing as to bacterial content and the several items listed under "Presence of colon," giving equal weight to each.

"The yearly standing, as given above, is an average of the monthly figures.

"Median count means the number of bacteria actually found in that sample which lies halfway between the high and low samples when all samples are arranged in sequence as to numbers of bacteria contained.

"Average number per 100 cubic centimeters refers to the average number of colon found in that amount of water, counting any presence of colon, whether it be 10 or 1,000 per 100 c. c., as 10 per 100 c. c.

"Actual average colon count is the total number of colon found in all samples divided by the number of samples taken.

"Under 'Type of treatment' V. R. means violet ray; S. F. means sand filtration; Chl. means chlorinization. With the exception of the

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Y. M. C. A. pool, which has liquid chlorine equipment, chlorinization means merely the addition of hypochlorite from time to time. Those pools which are listed as emptied have no treatment other than cleansing of the tank.

"Bacterial counts, of course, refer to the average number of all kinds of bacteria found in each cubic centimeter of water as determined from their growth on agar plates at 37 C. High bacterial counts may be due to one of a number of things; inadequate bathing on the part of the users of the pool—in other words, dirty bathers—tracking dirt into the pool, or possibly the failure of the pool's sanitary equipment to function properly. In pools having no filtration or sterilization the greatest care must be taken to let out *all* the water and to thoroughly clean the tank. High bacterial counts are usually the fault of the bathers, often partially and sometimes wholly due to negligence on the part of the personnel engaged in the care of the pool; seldom are they due to the actual breaking down of filtration or sterilization plants. Spitting, coughing, and blowing the nose in the water instead of in the gutters sometimes gives rise to high bacterial counts.

"Colon counts show the presence of intestinal organisms of the colon group. They are always due to fecal pollution, either tracked in or actually introduced into the pool.

"Adequate supervision of a pool, both with respect to the bathers and the cleansing and care of the pool itself, will insure clean water. Water should always be kept at such a height that there is a constant slight overflow into the gutters.

"We find that according to the bacterial standards agreed upon by the conference of State sanitary engineers all of Detroit's pools should be closed. We feel, however, that these standards are unnecessarily strict and are inclined to adopt a much more lenient one. The reasons for deciding upon a less stringent standard are two:

"1. After a careful investigation of Detroit's swimming pools, their equipment, the operation of equipment, the cleanliness of the pool, the shower and locker rooms, the supervision of the pool and its users, including exclusion of persons with colds or skin eruptions, or who have failed to take proper showers, we believe that the majority are being conducted in a reasonably sanitary and satisfactory manner, notwithstanding the fact that according to the strictest standards all of them should be closed.

"2. The bacterial standard is not an absolutely accurate index of the safety or danger of a swimming pool. It therefore seems unwise to exert all our efforts in attempting to enforce an impractical standard, and in so doing lose sight of other important factors.

"Under present conditions there is not so much danger of typhoid fever or other intestinal diseases as there is of eye, ear, nose, and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

throat infections. These infections are caused by secretions from the nose and throat and their presence is not accurately reflected in either the general bacterial or colon count. In other words, it is possible to get an eye, ear, nose, or throat infection in a pool having a low bacterial content.

"In an effort to reduce to a minimum this type of infection, in addition to the bacterial standard, the observance of two rules will be insisted upon:

"1. All persons having colds shall be refused admission to the pool.

"2. The water shall at all times be sufficiently high to insure a constant slight overflow into the gutters.

"While many of our pools are being conducted in a reasonably sanitary and satisfactory manner there is still room for improvement and some of the pools, especially the last 10 on the list, will have to make very decided improvements if they are to continue to operate.

"In the future all pools must observe, in addition to rules already adopted, such regulations as mentioned in this paper together with the following tentative bacterial standards:

"A median monthly bacterial count of not over 2,000.

"Not over 50 per cent of the samples during any given month shall show the presence of colon.

"Not over 20 per cent of samples during any given month shall show a colon count of over 10 per 100 c. c.

"While it is impossible to analyze the pools according to type of treatment with sufficient accuracy to say that this or that treatment is eminently more satisfactory than another, we can, perhaps, make two rather definite statements:

"1. That while the violet-ray treatment has in some instances proven very satisfactory, in certain other instances the operation of the plant has been decidedly unsatisfactory, due at least in part to the fact that the violet-ray equipment has not been operated continuously.

"2. That, in general, the pools which are merely emptied and cleaned are not in a satisfactory condition and must show a decided improvement if they are to continue to operate."

ADOPTION OF NEW HOUSING ORDINANCE BY THE CITY OF SAN DIEGO, CALIF.

The monthly Bulletin of the Department of Public Health, City of San Diego, Calif., indicates that overcrowding incident to inadequate and insanitary housing is recognized in that State as a dangerous factor making for the spread and development of communicable diseases.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A new ordinance makes it obligatory for every owner or lessee of a hotel or lodging house having six or more guest rooms, or an apartment house or a flat occupied, or where provision is made for the occupancy, by three or more families, to make application in writing to the board of health for an inspection and a permit of occupancy. The ordinance also provides that every owner or lessee of a hotel or a lodging house having ten or more guest rooms, or an apartment house (or flats) occupied or where provision is made for occupancy by five or more families, shall pay an annual inspection fee, as formerly, ranging from $3 per year for houses of 15 rooms or less to $5 per year for houses of more than 30 rooms.

The State housing laws adopted in 1917 exempted from the definition of "tenement house" any building not more than two stories in height to be occupied by not more than four families living independently of each other. The new State law which became effective in August, 1923, makes no such exemption. The term "apartment house" was substituted therefor and is defined as any building or portion thereof more than one story in height, which is designed, built, rented, leased, let, or hired out to be occupied, or which is occupied as the home or residence of three or more families living independently of each other and doing their cooking in the said building.

It is to be hoped before this country is again involved in war that health officials generally will have been successful in overcoming political and economic objections to the enforcement of proper housing laws, and that a sufficiently strong public opinion will have been developed to prevent the exposure of Army and Navy personnel to the very potent dangers of overcrowding in barracks during the days of mobilization and intensive training.

The substitution of the term "apartment house" for tenement house is logical. While they range through all degrees of elegance, apartment houses from the standpoint of community health are essentially tenement houses.

MEDICAL DEPARTMENT ACTIVITIES AT NAVAL TRAINING STATIONS.

Newport, R. I.—Sanitary reports show that health conditions have been unusually good during recent months. Freedom from diseases is credited in large part by the medical officer to hard training and drills judiciously combined with athletic sports in the open air plus a good commissary department, these factors making for a spirit of contentment and physical well being. The incidence of communicable diseases has remained low in spite of continued increase in the personnel resulting from increased recruiting activity. In general, the quality of recruits received in recent months has been above the revaage, although morethan usual numbers of the men recieved have

Digitized by Google Original from UNIVERSITY OF MICHIGAN

been found physically unfit or relatively undesirable. Ten per cent of the total number received during October should not have been enlisted, and were recommended for discharge from the service because of the following defects:

	Number of cases.
Flat feet, extreme	3
Underheight	9
Underweight	3
Underweight and underheight	6
Constitutional inferiority, mental	1
Genu valgum	1
Incontinence of urine	9
Epilepsy (grand mal)	3
Deformity, right arm	1
Atrophy of testicle	1
Deafness	1
Stammering	2
Color blindness	1
Defective and deficient teeth	1
Hernia, inguinal	1
Eczema, chronic	1

Besides these, 14 were relatively undesirable but were retained for corrective treatment. These also were cases where the men should have been rejected in the recruiting office, as indicated by the following list:

	Number of cases.
Eczema, chronic	1
Scabies, treated at naval hospital	6
Phimosis, complete, operated upon at dispensary	2
Hernia, inguinal, operated upon at naval hospital	2
Varicocele, operated upon at naval hospital	1
Hypertrophy of tonsil, operated upon at naval hospital	2

As a result of lack of attention to the mouth in the recruiting offices, more work continually presses upon the dental department of the station than can possibly be accomplished during the period of training. During August 52 per cent of recruits transferred from the station left with dental caries; in September, 56 per cent; and in October, 48 per cent.

Hampton Roads, Va.—The swimming pools have been watched closely as in previous months. Recently they have caused less anxiety, partly because they have been emptied and cleaned weekly and partly because the water in some of them has been chlorinated. The full complement of mercury tubes for the ultra-violet-ray system of purification has not been available. Therefore, no reliance has been placed upon that system. From observations and laboratory tests made at various times the efficiency of ultra-violet-rays for this purpose is doubtful, or so it appears to the medical officer. Efforts have been made to obtain from the manufacturers of the system definite information concerning results of bacteriological tests, but

Digitized by Google Original from UNIVERSITY OF MICHIGAN

only general statements and recommendations from interested parties have been forthcoming.

In connection with the campaign against mosquitoes and mosquito breeding, considerable use has recently been made of nitre cake obtained from the Naval Proving Ground, Indianhead, Md. This material is acid sodium sulphate with an excess of sulphuric acid. It has been used to prevent mosquito development in pools of water which were not accessible for spraying with oil. The nitre cake proved effective where a solution of sufficient strength was used. Experiments made in the station laboratory indicated that nitre cake is an effective larvacid when used on the basis of 1 pound for each gallon of water. As nearly as possible it has been applied according to this ratio, and it is believed results will prove satisfactory. A careful survey of the base was made for the purpose of locating all places where mosquitoes might possibly breed. No such places were discovered. It is therefore believed that property located outside of the base is the great source of trouble, and it is felt that so long as the authorities who have jurisdiction over that territory do not take steps to destroy the breeding places there it will be impossible to free the base of mosquitoes. There were seven cases of malaria during the month of October; four in September.

San Diego, Calif.—The morbidity rate continues high at this station. The daily average of sick increased from 5.1 in September to 8.1 in October. The increase was largely due to survey cases carried on the sick list and not to any increase of sickness resulting from communicable diseases.

Of 686 recruits received during the month, 80, or 11.6 per cent, had disabilities for which they should have been rejected in the recruiting office. The following table shows the number of recruits received from each of the several recruiting stations and the number from each group which it was found necessary to transfer to hospital for observation, as with "no disease":

Station.	Number of recruits.	To hospital.	Percentage.
Seattle	34	10	29.41
Salt Lake City	62	10	16.12
Portland	45	7	15.55
Kansas City	124	17	13.70
Houston	23	3	13.00
Denver	56	6	10.71
San Francisco	71	7	9.86
New Orleans	12	1	8.33
Dallas	49	4	8.16
Omaha	53	4	7.54
Los Angeles	157	11	7.00
Total	686	80	11.66

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The sanitary report for October states that the necessity for eliminating over 10 per cent of all recruits received reveals deplorable conditions at recruiting stations, for it is felt that the station has not been unduly severe in the matter of elimination. Of 690 recruits received, 41 were found physically unfit, 212 relatively undesirable, 144 not especially desirable, 41 were transferred to hospital, and only 252 were manifestly desirable. The medical officer believes that the percentage of "inaps" could be materially reduced by ordering medical officers to training stations for a period of from two weeks to a month prior to assignment to recruiting duty. It is thought they would quickly learn the cause of the large majority of rejections and that they would then be able to eliminate such cases in the recruiting office.

The dental department of the station is confronted with the same difficulty as the corresponding department at Newport, R. I. Because of dental defects found in a high percentage of all recruits received it is impossible to complete necessary work. In the cases of 714 men transferred from the station during October there were 1,062 cavities left unfilled. Practically all recruits transferred were still in need of dental service. It is believed that all recruits transferred to the fleet should be dentally fit but this is not possible with the present volume of work.

HEALTH OF THE NAVY.

This report covers the month of December, 1923. The usual seasonal increase in the prevalence of common respiratory diseases begins every year in November, so that comparatively high admission rates are to be expected in December, although these diseases usually do not reach their greatest incidence in the Navy until February.

The December admission rate for common diseases of the respiratory type—acute bronchitis, laryngitis, pleuritis, rhinitis, and tonsillitis—was 93.2 per 1,000 per annum. There is very little difference between this figure and the median December rate for the preceding five years, viz, 94.1.

Admissions for influenza increased to a total of 228. This figure represents an increase of 50 per cent over admissions for November. The resulting admission rate, 23.1, is almost twice as great as the five-year median rate for December, 12.7 per 1,000 per annum. The figures are rather significant even when due allowance is made for the fact that other infections of the upper respiratory tract are not infrequently designated as influenza. Outbreaks of influenza occurred in the Navy during the months of January and February, 1919, 1920, and 1922. Epidemics during the winter of 1919 represented a continuation of prevalence following the pandemic period during the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

autumn of 1918. It will not be surprising if the disease becomes epidemic during the next three months. The Weekly Health Index, published by the Bureau of the Census, which is based on telegraphic reports of deaths from 72 representative cities in the United States, does not reveal any increase in mortality above what is to be expected at this time of year. In fact the combined death rate of these cities was lower for the week ended January 5, 1924, than for the corresponding week in any of the preceding three years.

During December 23 cases of pneumonia were reported for the entire Navy as compared with 19 cases in November. These 23 cases make an admission rate of 2.3 per 1,000 per annum. The median December rate for the preceding five years is 3.9.

One case of cerebrospinal fever occurred at the naval training station, Newport, R. I., December 1. No case has been notified since then from any ship or station.

Measles cases were reported in increasing numbers during the month, the admission rate for the entire Navy increasing from 4.8 in November to 13.0 per 1,000 per annum in December. The five-year median rate for December is 4.7. Naval training stations accounted for most of the increase, with 57 cases at the naval training station, Hampton Roads, Va., and 47 at the naval training station, San Diego, Calif. Only 2 cases were notified by the United States Fleet. Movements of ships have interfered with regular correspondence and more cases may have occurred than are accounted for by monthly communicable disease reports received. One death from measles was reported in December among the cases occurring at Hampton Roads, Va.

Five sporadic cases of scarlet fever occurred at naval training stations, as follows:

Hampton Roads, Va	1
Great Lakes, Ill	2
San Diego, Calif	1
San Francisco, Calif	1

One case occurred in the receiving station, San Francisco, and 1 on board the U. S. S. *California*.

Seven cases of diphtheria were notified during the month; 4 among forces ashore and 3 afloat. These were all sporadic cases.

Mumps was less prevalent than in previous months. Eighty-five cases were reported, 76 of which occurred on board ship. This incidence is only about one-third as great as median experience for the month of December.

Dengue continues about as prevalent in Haiti and Santo Domingo as in recent months, 55 cases occurring among approximately 4,000 marines.

The admission rate for malaria continues at a lower level than in recent years. Sixty-two cases were notified in December, making the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

admission rate for the Navy 6.3 per 1,000 per annum for the month. The five-year median rate for December is 22.8.

The following table shows rates per 1,000 per annum for the principal communicable diseases, December, 1923. For comparison, corresponding median rates are given for the same month, years 1918 to 1922, inclusive:

	December, 1918–1922.	December, 1923.
Cerebrospinal fever	0. 08	0. 10
Diphtheria	. 99	. 71
German measles	. 63	. 51
Influenza	12. 70	23. 12
Malaria	22. 81	6. 29
Measles	4. 68	12. 98
Mumps	24. 44	8. 62
Pneumonia	3. 91	2. 33
Scarlet fever	. 54	. 81
Smallpox	0	0
Tuberculosis	2. 92	2. 03
Typhoid fever	. 08	0

VITAL STATISTICS.

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$, or $\frac{365}{35}$ or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

E. R. STITT.

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of December, 1923.*

	Forces afloat.	Forces ashore.	Entire Navy.	Marine Corps.
Average strength	75,406	42,928	118,334	21,660
All causes:				
Number of admissions	2,889	2,805	5,694	1,196
Annual rate per 1,000	459. 73	784. 08	577. 37	574. 25
Disease only:				
Number of admissions	2,529	2,534	5,063	1,071
Annual rate per 1,000	402. 44	708. 33	513. 39	514. 23
Communicable diseases, exclusive of venereal diseases:				
Number of admissions	275	389	664	168
Annual rate per 1,000	43. 75	108. 74	67. 34	80. 66
Venereal disease:				
Number of admissions	815	402	1,217	264
Annual rate per 1,000	129. 69	112. 37	123. 40	124. 84
Injuries and poisons:				
Number of admissions	360	271	631	125
Annual rate per 1,000	57. 29	75. 75	63. 98	60. 02

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE NO. 2.—*Number of admissions reported by Form F cards for certain diseases for the month of December, 1923.*

	Forces afloat, Navy and Marines (strength, 75,406).		Forces ashore, Navy and Marines (strength, 42,928).		Total (strength, 118,334).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases	2,529	402.44	2,534	708.33	5,063	513.39
Injuries and poisons	360	57.29	271	75.75	631	63.98
Total admissions	2,889	459.73	2,805	784.08	5,694	577.37
Class III:						
Appendicitis, acute	39	6.21	36	10.06	75	7.61
Autointoxication, intestinal	7	1.11	8	2.24	15	1.52
Cholangitis, acute	26	4.14	28	7.83	54	5.48
Cholecystitis, acute	1	.16	0	0	1	.10
Cholelithiasis	1	.16	1	.28	2	.20
Colitis, acute	3	.48	1	.28	4	.41
Constipation	10	1.59	14	3.91	24	2.43
Enteritis, acute	14	2.23	21	5.87	35	3.55
Gastritis, acute catarrhal	4	.64	10	2.80	14	1.42
Gastroenteritis	38	6.05	26	7.27	64	6.49
Hemorrhoids	19	3.02	15	4.19	34	3.45
Pharyngitis, acute	13	2.07	40	11.18	53	5.37
Ulcer of duodenum	2	.32	0	0	2	.20
Ulcer of rectum	0	0	1	.28	1	.10
Ulcer of stomach	1	.16	0	0	1	.10
Total	178	28.33	201	56.19	379	38.43
Class VII:						
Varicocele	10	1.59	6	1.68	16	1.62
Class VIII:						
Cerebrospinal fever	0	0	1	.28	1	.10
Chickenpox	7	1.11	6	1.68	13	1.32
Diphtheria	3	.48	4	1.19	7	.71
German measles	3	.48	2	.56	5	.51
Influenza	113	17.98	115	32.15	228	23.12
Measles	16	2.55	112	31.31	128	12.98
Mumps	76	12.09	9	2.52	85	8.62
Pneumonia broncho	5	.80	3	.84	8	.81
Pneumonia lobar	3	.48	12	3.35	15	1.52
Poliomyelitis, acute anterior	1	.16	0	0	1	.10
Scarlet fever	1	.16	7	1.96	8	.81
Total	228	36.28	271	75.75	499	50.60
Class IX:						
Dysentery, bacillary	0	0	5	1.40	5	.51
Dysentery, entamebic	6	.95	1	.28	7	.71
Total	6	.95	6	1.68	12	1.22
Class X:						
Dengue	19	3.02	50	13.98	69	7.00
Filariasis	0	0	3	.84	3	.31
Malaria	11	1.75	51	14.26	62	6.29
Total	30	4.77	104	29.07	134	13.59
Class XI:						
Tuberculosis (all forms)	11	1.75	9	2.52	20	2.03
Class XII:						
Chancroid	229	36.44	83	23.20	312	31.64
Gonococcus infection	494	78.61	241	67.37	735	74.53
Syphilis	92	14.64	78	21.80	170	17.24
Total	815	129.69	402	112.37	1,217	123.40
Class XVIII:						
Bronchitis, acute	121	19.25	230	64.29	351	35.59
Laryngitis, acute	4	.64	17	4.75	21	2.13
Pleurisy, acute fibrinous	9	1.43	8	2.24	17	1.72
Rhinitis, acute	24	3.82	8	2.24	32	3.24
Tonsillitis, acute follicular	320	50.92	178	49.76	498	50.50
Total	478	76.06	441	123.27	919	93.19
Class XX:						
Hernia	15	2.39	27	7.55	42	4.26

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal disease reported from ships for November and from various shore stations for the five-week period December 2, 1923, to January 5, 1924.*

	Annual rate per 1,000, November.			Average rate since July 1, 1923.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All ships	0	160.91	1,882.35	0	150.27	1,254.90
Battleship divisions—						
Battle Fleet	9.74	75.68	106.36	61.62	102.81	153.05
Scouting Fleet	43.01	84.25	129.83	95.33	134.81	180.54
Asiatic Fleet	[1] 0	703.20	1,125.00	135.44	583.31	850.39
Destroyer squadrons—						
Battle Fleet	0	52.92	533.33	0	70.87	293.99
Scouting Fleet	0	131.77	475.25	0	188.33	487.26
Asiatic Fleet	[1] 118.81	806.20	1,250.00	123.08	514.91	1,254.90
Miscellaneous—[2]						
Battle Fleet	0	113.14	360.00	0	106.19	273.97
Scouting Fleet	0	122.80	333.33	0	124.73	297.52
Asiatic Fleet	[1] 0	314.85	1,400.00	0	333.64	1,139.66
Naval forces, Europe	0	170.05	473.68	0	204.82	361.44
Special service squadron, based on Panama	0	178.32	307.69	158.53	213.86	295.80
Naval transportation service	0	179.23	768.00	96.36	168.01	391.64
Special duty	0	211.07	1,882.35	0	145.12	406.42
Miscellaneous and district vessels	0	186.14	394.37	0	230.98	517.24
	Annual rate per 1,000, Dec. 2, 1923, to Jan. 5, 1924.					
All naval districts in the United States	0	61.45	237.34	0	66.73	212.56
First naval district	0	37.46	195.49	25.30	51.53	212.56
Third naval district	13.67	23.97	37.82	15.40	64.51	103.99
Fourth naval district	84.97	114.83	142.68	34.33	106.70	170.45
Fifth naval district	80	75.34	165.74	0	66.94	93.78
Sixth naval district	43.33	48.37	106.67	44.15	56.11	203.01
Seventh naval district	0	0	0	0	0	0
Eighth naval district	66.41	69.03	107.44	51.19	52.96	61.98
Ninth naval district	104.92	104.92	104.92	103.71	103.71	103.71
Eleventh naval district	18.25	25.83	73.59	22.23	34.33	68.22
Twelfth naval district	30.03	95.73	237.34	38.58	95.51	184.70
Thirteenth naval district	59.54	74.89	94.55	51.69	90.88	147.27

RATIO OF GONOCOCCUS AND SYPHILIS INFECTION TO TOTAL CASES OF VENEREAL DISEASE.

	Per cent, November.		Per cent since July 1, 1923.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All ships	59.73	11.49	67.03	9.00
Battleship divisions—				
Battle Fleet	86.27	10.78	86.76	9.82
Scouting Fleet	72.91	6.25	71.61	6.65
Asiatic Fleet	[1] 37.04	20.37	38.91	17.68
Destroyer squadrons—				
Battle Fleet	79.17	12.50	88.75	6.25
Scouting Fleet	67.39	4.35	64.51	4.94
Asiatic Fleet	[1] 52.56	1.28	52.02	4.93
Miscellaneous [2]—				
Battle Fleet	76.59	19.15	85.18	8.99
Scouting Fleet	62.29	16.39	63.40	14.85
Asiatic Fleet	[1] 50.94	22.64	50.42	16.81
Naval forces, Europe	34.09	22.73	56.67	9.26
Special service squadron, based on Panama	58.82	5.88	53.85	5.98
Naval transportation	56.92	9.23	61.78	6.05
Special duty	68.29	2.44	68.18	4.17
Miscellaneous and district vessels	53.33	20.00	62.50	10.64

[1] Month of October, 1923.
[2] Vessels of train, base, air squadrons, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal disease reported from ships for November and from various shore stations for the five-week period December 2, 1923, to January 5, 1924*—Continued.

RATIO OF GONOCOCCUS AND SYPHILIS INFECTION TO TOTAL CASES OF VENEREAL DISEASE—Continued.

	Per cent, Dec. 2, 1923, to Jan. 5, 1924.		Per cent since July 1, 1923.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All naval districts in the United States	80.57	10.86	79.29	9.80
First naval district	78.57	14.29	81.42	15.04
Third naval district	40.00	40.00	70.83	13.89
Fourth naval district	71.43	21.43	73.97	12.33
Fifth naval district	80.52	9.09	75.68	10.21
Sixth naval district	90.90	0	74.24	6.06
Seventh naval district	0	0	0	0
Eighth naval district	83.33	0	84.62	0
Ninth naval district	100.00	0	87.62	6.67
Eleventh naval district	70.00	20.00	82.46	10.53
Twelfth naval district	78.57	7.85	83.53	8.24
Thirteenth naval district	87.50	12.50	95.83	4.17

TABLE No. 4.—*Number of admissions reported by Form F cards and annual rates per 1,000, entire Navy, for the five-week period, December 2, 1923, to January 5, 1924, inclusive.*

	Navy (strength, 96,674).		Marine Corps (strength 21,660).		Total (strength, 118,334).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000
Diseases of blood	1	0.11	0	0.00	1	0.09
Diseases of circulatory system	34	3.66	7	3.36	41	3.60
Diseases of digestive system	537	57.77	150	72.02	687	60.37
Diseases of ductless glands and spleen	2	.22	0	.00	2	.18
Diseases of ear	85	9.14	13	6.24	98	8.61
Diseases of eye and adnexa	68	7.31	22	10.56	90	7.91
Diseases of genito-urinary system (non-venereal)	143	15.38	20	9.60	163	14.32
Communicable diseases transmissible by oral and nasal discharges	500	53.79	80	38.41	580	50.97
Communicable diseases transmissible by intestinal discharges	7	.75	5	2.40	12	1.05
Communicable diseases transmissible by insects and other arthropods	84	9.04	82	39.37	166	14.59
Tuberculosis (all forms)	22	2.37	1	.48	23	2.02
Venereal diseases	1,136	122.20	260	124.84	1,396	122.68
Other diseases of infective type	260	27.97	77	36.97	337	29.62
Diseases of lymphatic system	52	5.59	16	7.68	68	5.98
Diseases of mind	45	4.84	11	5.28	56	4.92
Diseases of motor system	61	6.56	16	7.68	77	6.77
Diseases of nervous system	49	5.27	11	5.28	60	5.27
Diseases of respiratory system	1,108	119.19	219	105.15	1,327	116.62
Diseases of skin, hair, and nails	80	8.61	22	10.56	102	8.96
Hernia	37	3.98	12	5.76	49	4.31
Miscellaneous diseases and conditions	301	32.38	27	12.96	328	28.82
Parasite (fungi and certain animal parasites)	187	20.12	16	7.68	203	17.84
Tumors	7	.75	4	1.92	11	.97
Injuries	525	56.47	114	54.74	639	56.16
Poisons	64	6.88	11	5.28	75	6.59
Total	5,395	580.34	1,196	574.25	6,591	579.22

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 5.—*Deaths reported, entire Navy, for the five-week period, December 2, 1923, to January 5, 1924, inclusive.*

Causes.	Navy (strength, 96,674).	Marine Corps (strength, 21,660).	Total (strength, 118,334).
Dysentery, bacillary	0	1	1
Dysentery, entamebic	1	0	1
Measles	1	0	1
Pneumonia, broncho	2	0	2
Pneumonia, lobar	2	0	2
Tuberculosis, chronic pulmonary	1	0	1
Scarlet fever	1	0	1
Malignant growths	1	0	1
Other diseases	5	0	5
Drowning	3	1	4
Other accidents and injuries	14	4	18
Poisons	2	1	3
Total	33	7	40
Annual death rate per 1,000, all causes	3.55	3.36	3.52
Annual death rate per 1,000, diseases only	1.51	.48	1.32

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Medical Lib.

VOL. XX NO. 3

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

MARCH, 1924

(MONTHLY)

Compiled and published under authority of Naval Appropriation Act for 1924, approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

TABLE OF CONTENTS.

Page.

PREFACE v

NOTICE TO SERVICE CONTRIBUTORS VI

SPECIAL ARTICLES:

AVIATION ACCIDENTS AND METHODS OF PREVENTION.

By Lieut. J. F. Neuberger, Medical Corps, U. S. Navy 285

NOTES AND COMMENTS:

Aviation accidents.—Aeroplane accidents from the British viewpoint.—The estimation of physical efficiency.—The air ambulance in war.—Gas warfare in the air.—Ophthalmology in its relation to aviation.—Notes on aviation medicine in France.—Fellowship in the American College of Surgeons.—Vaccination against smallpox.—The instruction of hospital corpsmen 331

NAVY NURSE CORPS:

NOTES ON A COURSE FOR INSTRUCTORS OF NURSING 363

PREVENTIVE MEDICINE, STATISTICS:

REMARKS ON THE EPIDEMIOLOGY OF SMALLPOX AND THE PREVENTIVE VALUE OF VACCINATION WITH COWPOX VIRUS.—MEDICAL OFFICER RECOMMENDS ADOPTION OF A REGISTER FOR COWPOX VACCINATIONS.—REPORT OF A CASE OF CEREBROSPINAL FEVER AT THE UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.—MEDICAL BULLETIN OF THE DESTROYER SQUADRONS OF THE BATTLE FLEET.—PROPHYLAXIS OF VENEREAL DISEASE.—BACILLARY DYSENTERY IN GUAM.—PORTABLE CANVAS SACK STEAM DISINFECTORS AVAILABLE 395

PREFACE.

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form, such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX. MARCH, 1924. No. 3.

SPECIAL ARTICLES.

AVIATION ACCIDENTS AND METHODS OF PREVENTION.

By J. F. NEUBERGER, Lieutenant, Medical Corps, United States Navy.

No subject in preventive medicine as it relates to the military and naval establishments is of greater importance to the medical officer than that of aviation accidents. In looking over the literature dealing with aviation accidents and fatalities, one is surprised to note how little information is at hand, not only regarding the actual statistics and accurate accounts of these accidents, but also concerning suggestions and methods for their prevention. In the United States flying on a large scale has been carried on since 1917, both in the Army and Navy, and it is interesting to review the data available regarding accidents as well as the measures undertaken for their prevention.

The qualities that make up the successful flyer have been of interest to the world since flying became established. Many bizarre notions of these qualities have gained credence among the laity, who were prepared by their own ignorance or appetite for the romantic to accept as true fantastic notions on the subject. Flight itself appeals strongly to the imagination, therefore what could be more natural than to let fancy roam unrestrained when contemplating the man who does the flying? However, we are now divesting the aviator, little by little, of the glamor that shrouded his first appearance and are coming to know him more as he is, not as a different type, or a peculiar type, but as a normal human being endowed with quick judgment and resolute decision. These are the qualities that must be preeminent in the flyer. To these superlatives must be added certain physical requirements and the psychologist will append his demands for certain nervous standards.

Aviation is divided into two branches, namely, heavier than air and lighter than air. Each branch has its accidents with their particular causes. Heavier-than-air machines are very much in the majority at present and probably will be so in the future. The

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

statistics given in this article deal mostly with accidents to heavier-than-air machines, but the lighter-than-air accidents are included.

The United States Navy uses, in addition to sea and hydroplanes, a large number of machines of the land-plane type and therefore the lessons learned by the Army, air mail, and civil organizations must be considered and the statistics of the accidents taken into account.

In describing the causes of aircraft accidents the following classification was made by some of the early writers on this subject:

1. Mechanical imperfection of plane or motor.
2. Bad flying judgment.
3. Weather conditions.
4. Collisions.

Army medical officers have added a fifth cause, namely, propeller accidents.

W. G. Anderson, in his book on "Medical and Surgical Aspects of Aviation," classifies the causes of aviation accidents as follows:

1. Defects in airplane.
2. Error in judgment in flying.
3. Loss of head.
4. Brain fatigue or lethargy.
5. Fear.
6. Physical illness.
7. Unavoidable causes.

The rotation of this classification is not in accordance with the frequency of the occurrence of the accidents, as Anderson, in another classification, gives the following statistics in a series of 58 crashes:

Number of crashes.

Cause.	With injury to pilot.	Without injury to pilot.	Total.
(1) Airplane defect	1	0	1
(a) Breakage.			
(b) Engine failure.			
(2) Error of judgment	4	38	42
(3) Loss of head	6	1	7
(4) Brain fatigue	3	1	4
(5) Fear	0	0	0
(6) Physical illness	0	0	0
(7) Unavoidable	1	3	4
Total	15	43	58

According to the writer's experience, aviation accidents can be classified in accordance with the frequency of occurrence as follows:

1. Physical and mental defect in the pilot.
2. Insufficient knowledge and experience in the science of aviation.
3. Mechanical imperfection of plane or motor.
4. Weather conditions.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

5. Unavoidable causes, such as accidents due to fire or breaking of propeller while the machine is in the air. Propeller accidents are not included in the classification, as the writer does not consider it purely an aviation accident. Stepping into a propeller with resulting injury is no more a flying accident than stepping into a deck winch on board a ship or into the flywheel of an engine in a factory.

Physical and mental defect in the pilot.—It will be noticed in the above classification, that no mention is made of error in judgment. The writer includes those fatalities occurring as an error of judgment under mental defects. In selecting a man for aviation duty a psychological examination must be made and his judgment determined. While this seems a very difficult task, it is not as difficult as it seems. Close observation of the man and his behavior during examination, his reaction toward the examiner, his previous personal and family history and psychological tests will help the examiner to get a fairly accurate opinion of the applicant for aviation duty.

It was noticed by the writer during his tour of training at the air station at Pensacola that numerous officers and men, who had been passed by the medical officer, were disqualified later by the instructors on account of slowness in reaction or some other mental defect, which in ordinary walks of life does not hinder the individual. These men without exception were efficient officers in some other branch of the service, but they did not possess the characteristics necessary to make them successful aviators. At the air station at Pensacola, after the applicants have passed the physical examination, they take a course in ground work on aviation subjects. This work is commonly spoken of as the "ground school." The writer knows from personal experience that it would be an excellent procedure to have a flight surgeon take this course with every class, for an experienced flight surgeon can pick out a number of men in the ground school whose mental faculties are such as to make them unfit for aviation duty, and which may prove dangerous when actual flying activities begin. This course in the ground school lasts about six weeks; then the student begins actual flying. Every student is given 10 hours' instruction, after which time he must "solo" or fly alone. Most apt students solo after six or eight hours. If a student does not solo in 10 hours he is brought before an advisory board consisting of three experienced fliers, who decide if the student has possibilities as a flier; if he has desirable qualifications he is given three hours' additional instruction. This brings up a very interesting point in connection with the mental faculties of individuals for flight training. The writer, at the time of his course at Pensacola,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

had often wondered why and how the 10-hour standard was adopted, and he has talked this point over with a number of instructors and officers in charge of flight training who have had a great deal of experience in flying instruction. The argument put forward against this time limit was that there are many men who are slow in learning, but when they have learned a thing they retain it and use it at all times to best advantage. A number of instructors agreed with this statement and stated that such had been their experience with a great number of men.

The explanation given for the 10-hour standard by the majority of officers in charge was about as follows. It has been the experience of most instructors that most students can learn to solo in less that 10 hours, and that students who fail to solo in 10 hours will not make, as a rule, very good fliers. Of course, there are a few exceptions to this rule. I believe, considering it from a psychological point of view, that the last explanation and observation is very good and one that should be followed. If the student does not learn to fly in 10 hours then his judgment and learning capacity are not as good as those that do learn in the stipulated time, and while his power of retention may be just as good, he lacks speed in learning and shows to some degree a mental slowness, which is one of the things making him unfit for aviation duty. Quickness of judgment is one of the prime requisites in flying, and slow-thinking individuals had better stay on the ground, although they may be intellectually superior to those actually flying. The writer brings up this point, because error in judgment is frequently given as the cause of accidents and the above facts will help to explain the reason why the writer classifies error of judgment under mental defects; slowness in forming judgment is certainly a mental defect considered from an aviation point of view. Physical and mental defects of the pilot are given in the above classification as the most frequent cause of aviation accidents, and the statistics in this article substantiate its deserved place. The English stated that in the first year of the war, when examinations were not carried on by a medical officer especially trained to conduct these examinations, that over 90 per cent of the accidents were due to physical and mental defects of the pilot. And while at present these figures are somewhat reduced, the majority of accidents, if minutely scrutinized will be found to be still due to the same cause. The remedy is simple and can be expressed in two sentences, namely, the most rigid physical and psychological examination of all flying personnel and specially trained medical officers to conduct the examinations. The examination for flying personnel has been described in a previous article and the writer therefore does not wish to discuss any detail of this

Digitized by Google Original from UNIVERSITY OF MICHIGAN

examination, but wishes to emphasize again that the examination must be rigid, especially for candidates just entering the aviation service. After the student has finished his aviation training and is qualified as a pilot, his physical and mental efficiency must be maintained, a task more difficult than the original examination.

The importance attached to this task is realized by the Navy Department and has resulted in the following letter from the Secretary of the Navy to all aviation activities:

1. The department expects every member of the Naval Establishment to maintain himself in the best possible physical condition in order that he may be prepared to render efficient service under the most strenuous conditions. It is particularly necessary that officers and men who are engaged in active flying duty maintain themselves in the best possible physical condition at all times.

2. Any man is justified and right in taking a chance which may cost him his life, provided the ends to be obtained are commensurate with the risks involved. The department expects such action from all members of the Naval Establishment. However, one of the oldest military maxims is that unnecessary sacrifice of life is a crime against the service. This should be constantly borne in mind by all who are engaged in duty involving flying; for if these men neglect to maintain the best possible physical condition they jeopardize not only their own lives but the lives of such others as work with them.

3. The department desires that all commanding officers take necessary steps to insure that men who are not in proper physical condition, regardless of the cause from which such condition may arise, be not permitted to engage in flying.

EDWIN DENBY.

The task of keeping fliers fit and seeing that they do not fly if they are not fit, causes the flight surgeon a great deal of embarrassment, as he may be called upon to recommend suspension from flying duty of one of his best friends which usually causes a certain degree of animosity. The most violent protests and arguments are put forth on these occasions. An officer of rank recently tried to convince me that the staying out until 6 o'clock in the morning would not interfere with his flying the same morning and that his physical condition was just as good as the day before, and that he was in fit condition to fly, on which point, however, we could not agree. The officer maintained that he had not drank anything, which I knew positively to be a fact, as he has never been known to do so, and he for that reason, insisted upon being in excellent shape and fit to fly. It may be possible that this officer who is very strong, athletic and healthy, may have had sufficient reserve energy to carry on an extensive flight. He may have been fit, but I do not consider it a wise policy to fly after practically no sleep at all and besides, it is a bad precedent for other officers.

Regarding the maintenance of the flier, I wish to state again that too much indulgence in alcohol and the bright lights of a great city,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

with a tendency toward overexertion in many ways, has been the cause of the loss of many good fliers to the service. Clouded brains from hang overs are not fit to direct an air or sea plane. Close attention should be paid to the pilot on Monday mornings and the days following other holidays. The medical officer of the United States Naval Air Station, Pensacola, Fla., informed the writer that 66 per cent of all accidents within the past two years occurred on Monday or on days following holidays. The reason for this is quite obvious. The question then is asked, how can we determine the exact physical condition of a certain pilot on a certain Monday morning?

On the U. S. S. *Wright*, flagship of the Aircraft Squadrons, Scouting Fleet, we determine each pilot's exact normal circulatory efficiency rating, commonly known as the Schneider index. In the November, 1922, issue of the UNITED STATES NAVAL MEDICAL BULLETIN, appeared a description of the physical efficiency rating scheme devised by Dr. Edward C. Schneider. The description of this test appeared in the BULLETIN in response to the following question submitted by a medical officer: What is the best method of ascertaining the efficiency of the cardiovascular system of the individual when the electrocardiograph or other such instruments are not available? In preparing the answer to this query the editor utilized the Schneider index as published in the Journal of the American Medical Association, May 29, 1920. Since the publication of this article some changes have been made in this index by Schneider, as the result of observations made on a great number of persons. The changes made were instrumental in making the index much more reliable. The Schneider index is of special use in aviation, as we have to deal more with temporary than permanent ailments, because men with marked physical defects are weeded out before they reach the stage of flying; furthermore, we encounter in aviation as well as in other walks of life, a condition known as staleness. While this condition is not very serious in persons in civilian life, in aviation it may have very fatal consequences.

There are a number of other tests to be found in the literature, but for practical purposes, and as a short and simple test, the Schneider index seems to be the best effort in this direction. As the test was minutely described in the NAVAL MEDICAL BULLETIN, no further discussion of it is necessary except to mention the changes mentioned above. The procedure in making observation is as follows:

1. The patient reclines for five minutes. (*a*) The heart rate is then counted for 20 seconds. When two consecutive 20-second counts are the same, this is multiplied by 3 and recorded. The score is noted according to Part A, Table 1. (*b*) The systolic blood pressure is next taken by auscultation; two or three readings are made as a check.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TABLE 1.—*Points for grading cardiovascular changes.*

A. Reclining pulse rate.		B. Pulse rate increase on standing.				
Rate.	Points.	0–10 beats.	11–18 beats.	19–26 beats.	27–34 beats.	35–42 beats.
		Points.	*Points.*	*Points.*	*Points.*	*Points.*
50–60	3	3	3	2	1	0
61–70	3	3	2	1	0	−1
71–80	2	3	2	0	−1	−2
81–90	1	2	1	−1	−2	−3
91–100	0	1	0	−2	−3	−3
101–110	−1	0	−1	−3	−3	−3

C. Standing pulse rate.		D. Pulse rate increase immediately after exercise.				
Rate.	Points.	0–10 beats.	11–20 beats.	21–30 beats.	31–40 beats.	41–50 beats.
		Points.	*Points.*	*Points.*	*Points.*	*Points.*
60–70	3	3	3	2	1	0
71–80	3	3	2	1	0	0
81–90	2	3	2	1	0	−1
91–100	1	2	1	0	−1	−2
101–110	1	1	0	−1	−2	−3
111–120	0	1	−1	−2	−3	−3
121–130	0	0	−2	−3	−3	−3
131–140	−1	0	−3	−3	−3	−3

E. Return of pulse rate to standing normal after exercise.		F. Systolic pressure, standing, compared with reclining.	
Seconds.	Points.	Change in millimeter.	Points.
0–30	3	Rise of 8 or more	3
31–60	2	Rise of 2–7	2
61–90	1	No rise	1
91–120	0	Fall of 2–5	0
After 120 (2–10 beats above normal).	−1	Fall of 6 or more	−1
After 120 (11–30 beats above normal).	−2		

2. (*a*) The patient stands at ease for one or two minutes to allow the pulse to assume a uniform rate. When two consecutive 20-second counts are the same, this is multiplied by 3 and recorded. The score is obtained by use of part C, Table 1. The difference between the standing and reclining pulse rates is scored then by use of part B, Table 1. (*b*) The standing systolic pressure is next taken. The difference between this and the reclining systolic pressure is then scored by part F, Table 1.

3. The patient next steps on a chair about 18 inches high, five times in 15 seconds, timed by a watch. To make this test uniform, he stands with one foot on the chair at the count one; this foot remains on the chair and is not brought to the floor again until after the count five. At each count he brings the other foot on the chair and at the count "down" replaces it on the floor. This should be timed accurately, so that at the 15-second mark both feet are on the floor. (*a*) Immediately, while he stands at ease, the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pulse rate is counted for 15 seconds; this is multiplied by 4 and recorded. (*b*) Counting is continued in 15-second intervals for two minutes, record being made of the counts at 60, 90, and 120 seconds.

The data from (*a*) will be scored by part D, Table 1, taking the difference between this exercise pulse rate and the standing rate. The data in (*b*) are scored according to part E, Table 1.

As seen from the above table, 18 represents a perfect score. Schneider assumes, with very good reason indeed, that a score of 9 or less indicates that there is something wrong with the individual and that a thorough physical examination should be made.

Aboard this ship a pilot on first reporting for duty has his index determined on three consecutive days, taking into consideration the amount of sleep and exercise. The average of the three days is registered as his normal index and this figure gives the medical officer something to go by in the future. The index is taken weekly or whenever it is considered necessary. We have a blackboard in the sick bay with the names of all pilots, and on this board is registered his index, the amount of sleep and exercise, and the daily and weekly flying hours. We therefore have figures for comparison. If a pilot, for instance, has an average index of 14, and on two consecutive weeks shows an index of 10, we know that he is not up to normal and something must be wrong, and he is immediately examined with the view of locating the difficulty of whatever character it may be, physical or mental. This is done weekly on all pilots and on others whenever the medical officer thinks it necessary, and it is considered an excellent procedure.

Last year during the fleet maneuvers at Panama, where an immense amount of flying was carried on by the aircraft squadrons, this index was of valuable assistance. As a matter of fact, it was the only method for practical use, as it only takes a few minutes to perform and does not therefore interfere too much with the pilot. During the flight to Panama, and during the maneuvers, it became necessary on several occasions to temporarily suspend pilots from flying duty and one pilot had to be permanently relieved. It is my conviction that accidents would have occurred had this procedure not been instituted, and the Schneider index gave the first indication that something was wrong. As a result, I am able to give the following recapitulation of all flying done during the past winter by planes of the Scouting Plane Squadron and I am glad to say that there was not a single accident.

Total number of flights	1,187.
Total flying time	2,650 hours 47 minutes.
Total mileage flown	170,000 miles.

The above flying was divided as follows:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

	Hours.	Minutes.
Test flights	106	19
Passage flights	1,793	37
Scouting flights	319	25
Maneuvers, spotting, etc	286	22
Escorting fleet	33	30
Photographic flights	111	34

I believe it is remarkable that we did not have a single accident when one considers that these planes, 18 in number, flew from Norfolk, Va., to Panama, leaving Norfolk in the midst of winter, when it was exceptionally cold and much difficulty was experienced in starting the motors. The writer wishes to state further, that at the writing of this paper, October, 1923, the aircraft squadrons of the Scouting Fleet has not had a single accident.

The writer does not wish to be too optimistic, but he believes that with thorough supervision of the personnel the accidents in any aviation unit will ultimately be markedly reduced. It takes time and ingenuity to make improvements in designs of planes and engines, and accidents due to mechanical failure are not so easily eliminated; but in considering the statistics given in another portion of this paper we note that there is a small percentage of fatalities resulting from mechanical failure compared with those from other causes. Thorough supervision of the personnel is the answer at present for the prevention of accidents. This is not easy, but must be done. It is difficult for the flier, as well as the medical officer. It entails a lot of personal sacrifice on the part of the pilot, and anyone making application for aviation training should understand this point. The author realizes how difficult it is to leave an evening entertainment in order to obtain the necessary amount of sleep for flying next morning. Anyone who is not willing to give up a certain amount of pleasure and make some personal sacrifices had better wait before taking up flying until the mechanical perfection of the plane has reached a stage where the personal and human element have no longer any influence and flying is absolutely safe. This stage of perfection is something we all are looking forward to, but probably will never reach.

One of the most common defects found on original examination, as well as on annual examination of pilots, is overweight. In the Manual for the Medical Department, United States Navy, the average body weight for height and age are given as standards. It is true that certain allowances must be made for differences in the weight of the bony and muscular structures. A variation of 10 per cent in either direction will for practicable purposes account for any excess or deficiency in body weights due to normal differences in the weights of the bones and muscles. Ten per

Digitized by Google Original from UNIVERSITY OF MICHIGAN

cent or more above the average should constitute a physical defect. While excess fat may not have an immediate apparent detrimental effect upon the physical efficiency, its presence will favor the development of serious degeneration and organic disease. Furthermore, an officer, by permitting himself to become overweight, has displayed a lack of interest in his physical condition which is far from being in accord with the duty he owes the service and which is itself an evidence of inefficiency. Overweight will not develop except as a result of improper habits of living on the part of the individual. In fact, overweight is always, except in rare instances, due to eating too much or to exercising too little, or both, and such habits are diametrically opposed to the precepts of military training.

In practically all cases excess fat can be removed by the individual himself, if he so desires. In a few cases, such as the older officers who have been overweight for a number of years and who have already developed other physical defects, rapid reduction in weight might not be advisable and possibly could not be accomplished without a great deal of discomfort and some danger to health. However, in aviation, where we have the younger and more active officers, there is no excuse for overweight. Every cell in the body is derived primarily from the food, and excess fat simply represents excess food consumed. There is no other source of fat than the food and drink taken in through the mouth. The body processes of certain persons are such that they convert excess food into fat much more readily than do others. This does not justify the consumption of more than the amount required by the body merely to gratify the appetite. The body requires food for the purpose of rebuilding or repairing the worn tissues and providing energy for the muscular activities, and excess foodstuffs, especially fats and carbohydrates, have to be deposited in the tissues as fats. The maintenance of the proper body weight is then a question of balance between the intake of fat and carbohydrates and the energy expended in muscular exercise. In an overweight person, if the amounts of fat and carbohydrates consumed are less than required for the daily activities of the body, a reduction in weight will occur. All overweight officers should be given appropriate advice by the medical officer or should obtain some good scientific book on this subject. Not only officers assigned to aviation, but all officers of the Navy should watch themselves carefully, so as not to acquire an excess amount of fat.

The relation of the medical examiner to the naval officer should be one of help and assistance. Where formerly it was almost the sole duty on physical examination to cull out the physically unfit

Digitized by Google Original from UNIVERSITY OF MICHIGAN

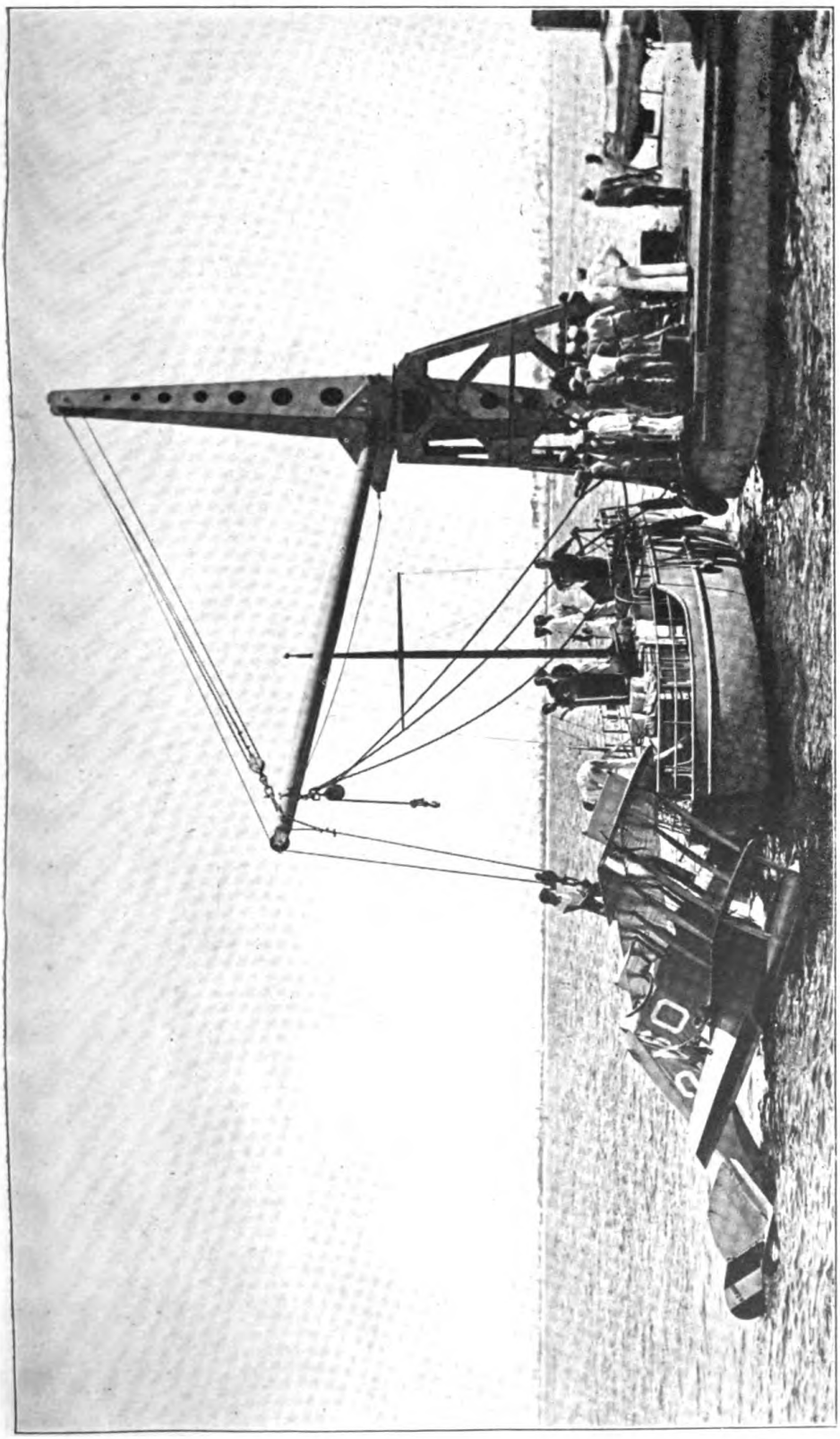


Fig. 2.—ANOTHER N-2 CRASH. NOTE THE SAME BREAK IN THE TAIL AS SHOWN IN FIGURE 1. A TYPE OF ACCIDENT VERY DANGEROUS TO THE OCCUPANT OF THE REAR SEAT.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

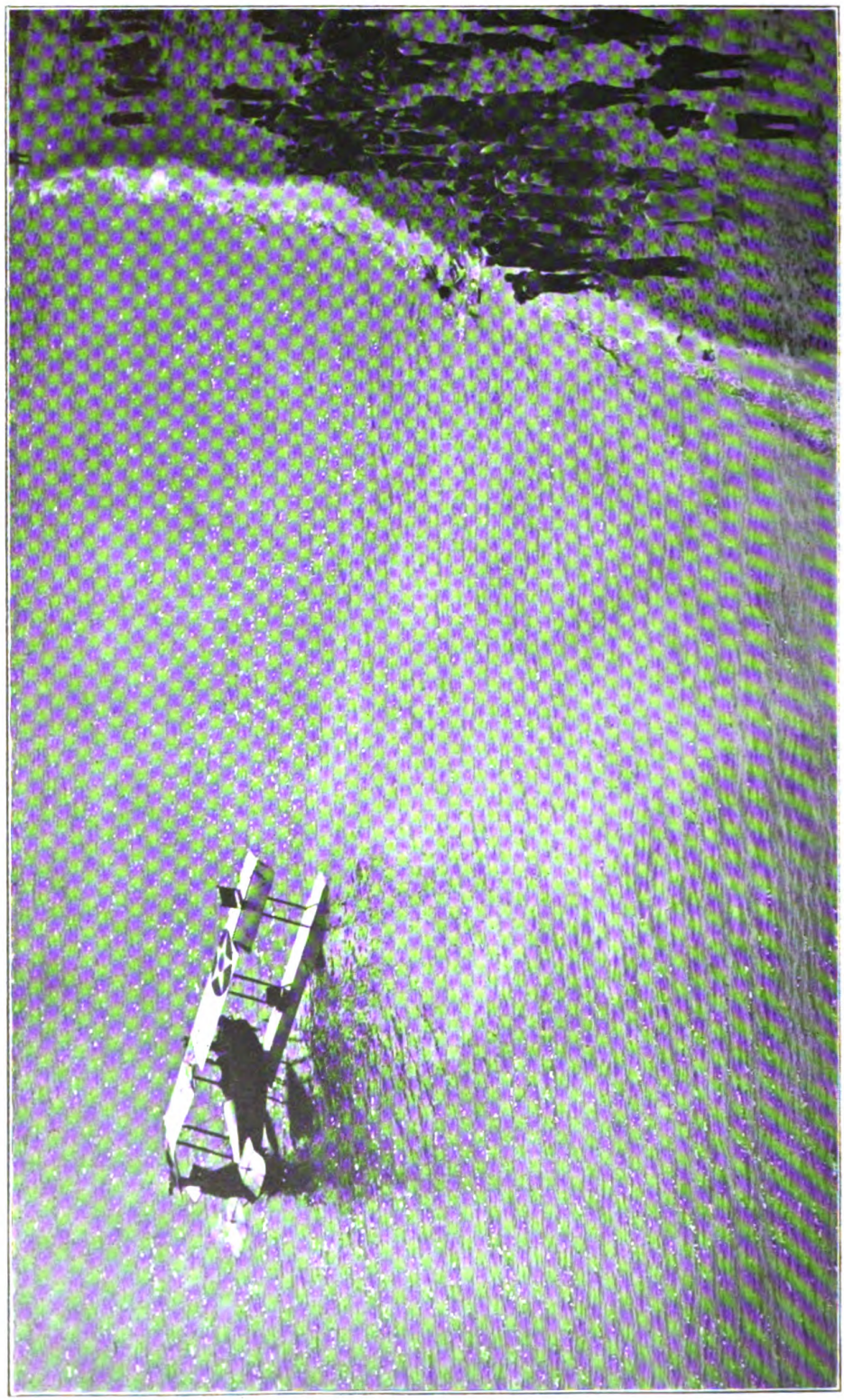


Fig. 3.—THE PILOT OF THIS PLANE ZOOMED OVER THE BEACH WHERE MANY PEOPLE WERE BATHING, KILLING FOUR. NOTE THE TEARING OF THE LEFT WING.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

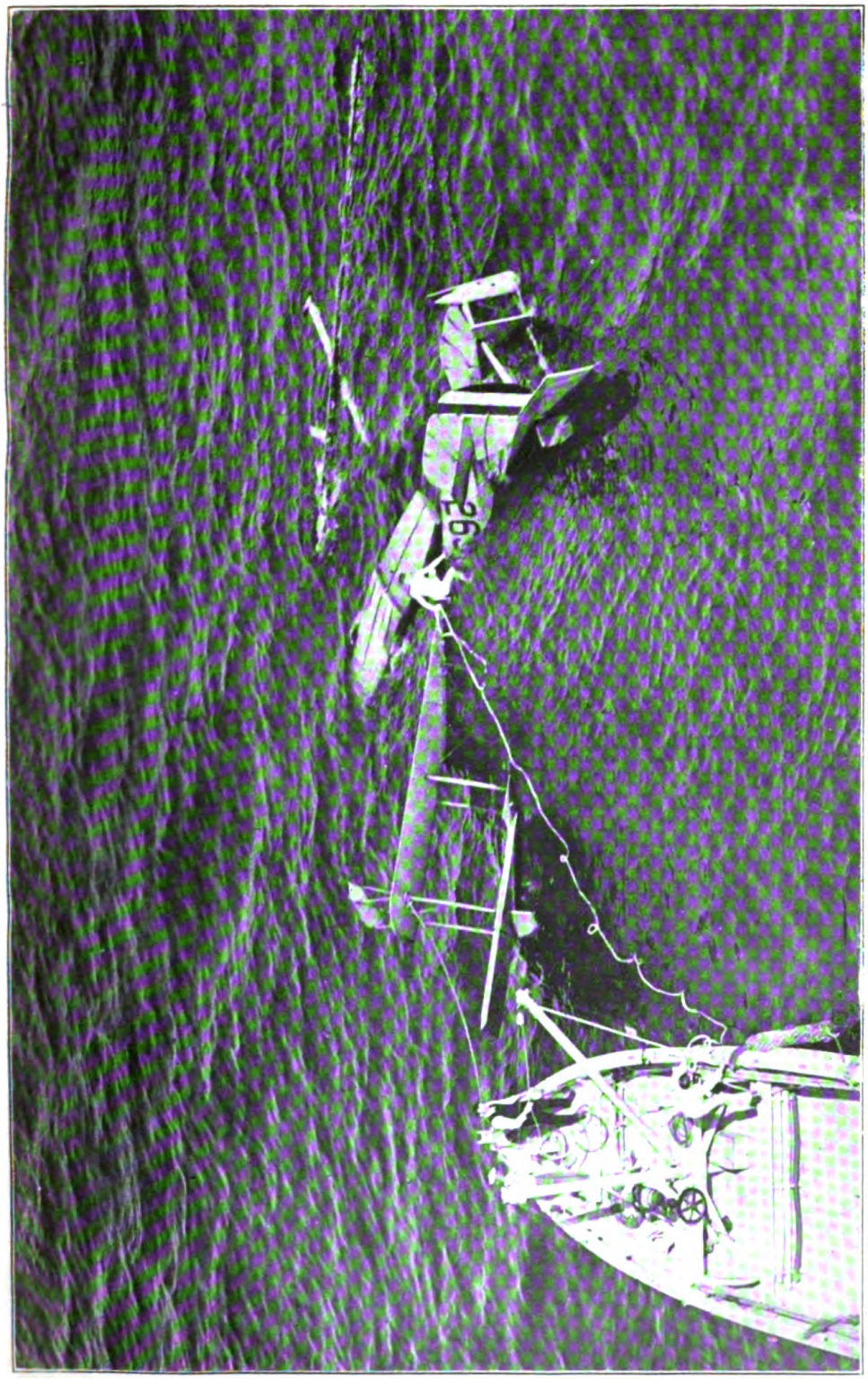


Fig. 4.—CRASH OF HS-2 FLYING BOAT. THE PILOT EITHER JUMPED OR LOOSENED HIS LIFE BELT. HE WAS FOUND IN THE WRECKAGE.

294—3

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

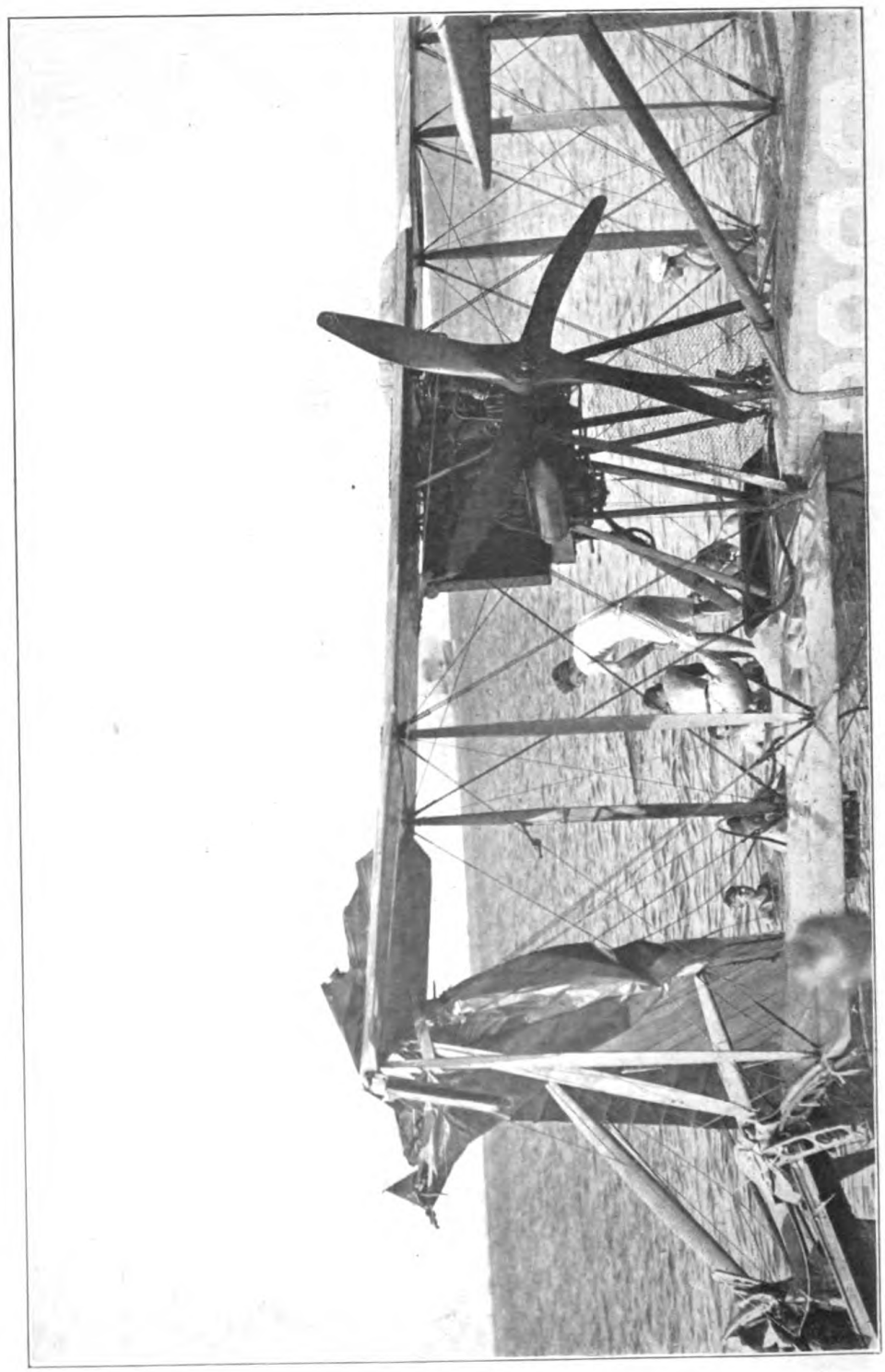


Fig. 5.—ACCIDENT CRUSHING THE WING OF A LARGE TWIN-MOTOR SEAPLANE.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Fig. 6.—PLANE, BADLY WRECKED, BEING LIFTED OUT OF WATER. NOTE THE SEVERE DAMAGE TO WINGS AND PROPELLER.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

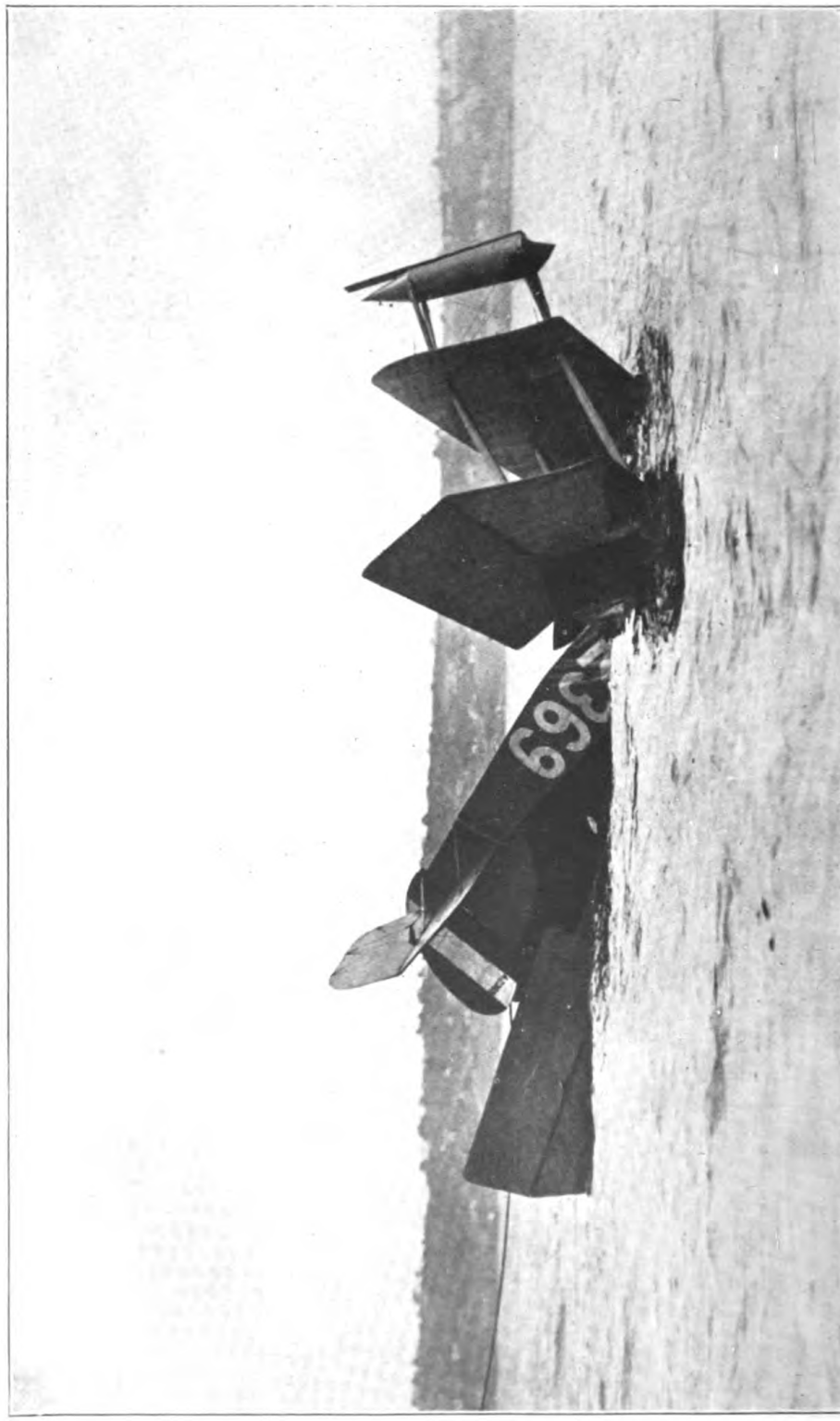


Fig. 7.—TAIL SPIN FROM TURN AT 200 FEET ELEVATION.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

and initiate action which might lead to retirement, or in aviation, to suspension from flying duty, the medical officer and the flight surgeon of to-day plays the rôle of medical adviser to the examinee, whose interest it is his duty to protect, by rendering it possible to remove those conditions which might ultimately lessen his efficiency, cause his retirement, or shorten his life.

Insufficient knowledge and experience in the science of aviation.—While causes of aviation accidents, except physical and mental defects, do not belong to the sphere of the flight surgeon, a short discussion of them is considered not to be out of place in an article of this sort. Inexperience is a very common cause of accidents. Reference has been made above to the method of training students in aviation in the United States Navy. Applicants, after passing the required standard physical examination, are sent to the United States Naval Air Station at Pensacola, where they receive a course in the ground school work, and after about six weeks flying is begun. The student is given 10 hours of dual instruction and then begins to solo in a certain type of plane. He is then taught acrobatics, which is, despite many opinions to the contrary, absolutely necessary. It is not only necessary in combat work, but a plane may go into a spin, and the pilot must know how to straighten his machine. The learning of acrobatics is not always a pleasant experience, and the writer, on his first and second instruction periods in this sort of work, became extremely ill. The sudden and rapid turning of the machine caused dizziness, nausea, and vomiting, and, fortunately for the writer, the instructor took the controls, otherwise he would not be here to tell the story. As far as he was concerned, he felt so ill it did not matter to him where and when the plane landed. However, after awhile, one overcomes this feeling. After the instruction in the training plane is finished, instruction is given in larger flying boats, such as the types used by the aircraft squadrons. After this, a certain number of the students are trained in torpedo and land planes. In the land-plane training the student is taught combat work. This involves mastery of the tactics and acrobacy involved in actual fighting. The student is taught how to attack, how to fight, and how to extricate himself if attacked by superior numbers. To the young, ardent, and unimaginative flying officer of our services will naturally fall the carrying out of this work. Youthful pilots, by virtue of keenness of vision, sensitive reflex action, and lack of imagination, which, for the peculiar requirements of aerial pursuit and combat work, is a most desirable asset, are unquestionably best equipped mentally and physically to take the fast flying, fast landing combat planes into the air. Every student officer, after completing the course, should be selected for the duty for which he is best fitted

Digitized by Google Original from UNIVERSITY OF MICHIGAN

at the time—either combat, scouting, bombing, or other duty. This selection for special duty will give him additional experience and eventually make him a seasoned flier.

At Pensacola certain rules and regulations are issued covering flying which protect both the student and the instructor. These rules were formulated as a result of experience and careful investigation. For instance, no one is allowed to perform acrobatics below 3,500 feet, and stunting can only be done in the stunt field, a place especially laid aside for the purpose. Machines will be taken off and landed against the wind only, and there are many other rules too numerous to mention. It is surprising how often these rules are violated, not only by students but also by fliers of long experience, not only at Pensacola but many other places. Not very long ago the writer saw a seasoned flier of long experience perform stunts at an altitude so low that he could be seen actually hitting the tops of trees. Engine or other structural failure, in circumstances of careless flying and stunting at low altitudes, almost invariably causes fatal crashes resulting in the loss of expensively trained personnel and valuable material not to mention the deleterious effect on the morale of the aviation service as a whole. Severe and prompt discipline should be meted out to those flying officers who, through childish desire to be recognized as pilots of exceptional skill and daring, unduly hazard their lives, the Government equipment with which they are intrusted, and the integrity and efficiency of the aviation units of which they form a part. There is an old slogan in aviation, which should be carried in one's mind at all times, " Be the oldest, not the boldest aviator."

Skill and knowledge are especially essential in formation flying. With the construction of large numbers of planes and their use in large groups in time of war, formation flying becomes essential. This type of flying is very dangerous and requires infinite care and watchfulness, especially in executing turns. Collisions are very liable to occur and may result in several deaths, since almost without fail the planes are so badly damaged that they are entirely out of control. In a formation one poor flier is a menace to the entire squadron, and erratic fliers should not be present. Blind angles of the machine, crowded conditions of flying centers, small flying fields, neglect of regulations, momentary inattention, or slight faults in maneuvers in formation flying are frequent causes of collision.

Mechanical imperfection of plane or motor.—The number of crashes in the United States Navy during the year 1921–1922 due to engine or structural failure was 24, making a percentage of 22.5 of all the total number of crashes. The prevention of this type of crash

Digitized by Google Original from UNIVERSITY OF MICHIGAN

CHART NO. 1.—*Statistics of injuries to aviation personnel from 1917 to 1921, inclusive.*

NOTE.—Key letter R=Aeronautic duty. C-R (conflagration); D-R (drowning); G-R (traumatism by fall); H-R (traumatism by machines); I-R (traumatism by other crushing; F-R (traumatism by explosion); E-R (traumatism by firearms); L-R (traumatism due to other causes).

	1917								1918								1919								1920								1921								
	C-R	D-R	G-R	H-R	I-R	F-R	E-R	L-R	C-R	D-R	G-R	H-R	I-R	F-R	E-R	L-R	C-R	D-R	G-R	H-R	I-R	F-R	E-R	L-R	C-R	D-R	G-R	H-R	I-R	F-R	E-R	L-R	C-R	D-R	G-R	H-R	I-R	F-R	E-R	L-R	
Abrasions:																																									
Face			1								1	1																													
Leg			1								1																														
Arm																											2								2						
Avulsions:																																									
Leg												1																													
Arm																				1																					
Hand																				2																					
Burns:																																									
Face									1							2																									
Multiple	2		1						5		6			7		1			3							2					1	3		2					1		
Contusions:																																									
Abdomen			1								3								1																						
Back											6								3							2								2							
Eye											2																				2										
Face											2																														
Foot											2																														
Hand												1														1			1					1							
Head											4					1																									
Hip												1							1																						
Knee											3								1							1		1						1	1						
Leg											2								1									1													
Mouth																1																									
Neck											1																														
Nose											3								1																						
Thigh											5								3	1																					
Thorax											3	2							1							1															
Crush:																																									
Leg											4																	1													
Multiple																					1							1							2						
Dislocation:																																									
Elbow											2	1																													
Hand																			1																						
Leg												2															1								1						
Shoulder											1					1																									
Vertebra											1		1						2																						
Drowning		4								35	1							21								12	1							12	1						
Fracture:																																									
Compound—																																									
Multiple											1																	1								4					
Nasal											2																														
Phalanges													1																												
Radius and ulna												3																													
Skull											12	5							1																						
Tibia												1																													
Tibia and fibula								1			3	1				1			2																						
Simple—																																									
Carpal											1																														
Clavicle											2								2									1													
Femur											1														1			1	1							1					
Fibula											2					1																									
Metacarpal											2		1																												
Metatarsal												1																													
Multiple											2																	1	2												
Nasal			2								3					1				1																					
Radius											2	1							1	1																					
Radius and ulna											1	1							1	2								1													
Rib			1								5								4									1								3					
Skull											4	2							7																	1					
Tibia and fibula											4								3																						
Vertebra			1								3			2					5																						
Hematoma, traumatic, eye											1																														
Hemorrhage into eyeball											1																														
Intercranial injury			1								3	1								1																					
Interspinal injury											1																												1		
Multiple injuries extreme	1		2								25	3		3					1		2		2				1								1						
Rupture:																																									
Traumatic—																																									
Heart											1																														
Kidney											1																														
Lung			1								2																														
Sprain:																																									
Ankle											6	1				2											2								2						
Leg											1																3								3						
Pelvis											1																														
Vertebra											5	1																													
Wrist												1																													
Submersion (nonfatal)												1	1	1												1									1						
Wounds, punctured:																																									
Abdomen									1																																
Face											1																														
Wounds, lacerated:																																									
Elbow												1							1																						
Eye			1									1																													
Face											8	1							4									2								1					
Finger												4							1																	2					
Hand											2	1							1	1																					
Head			2								6	2							4	1								2								2					
Lung											1																														
Mouth			1								4																								1					1	
Multiple																1																									
Neck												1																													
Scrotum											1																														
Thigh											1																														
Wounds, incised:																																									
Face											1																														
Head			2								2	1																													
Jaw											1																														
Knee											1																														
Mouth											1																														
Wounds, unqualified											2								1																						
Dead	2	4	1							36	50	10		6				21	14		2		2			3	12	7	4					3	12	4	7				

is essentially an engineering problem, and it is believed its accomplishment is a matter of time. It involves the employment of the highest grade of mechanical ingenuity, skill in design and construction of the plane, and the utilization of only the best material obtainable.

One of the flight surgeons of the United States Army, a trained pilot, stationed at McCook Field, recently lost his life while flying, when for some reason one of the wings of his plane crumbled to pieces while in mid-air.

Weather conditions.—The most important weather conditions encountered by the flier are clouds, fogs, winds, and rains. Fogs absolutely prohibit flying and great care should be taken in flying long distances. It has often happened that a flying squadron leaving one place where the weather was delightful and the sun shining brightly suddenly encountered fog, making further flight dangerous. Landing in a dense fog is almost impossible and if a successful landing is made it is a matter of luck. In flying long distances, accurate weather reports should be obtained before starting the flight. This is always possible in time of peace but not in time of war.

Unavoidable causes.—Under this heading we include such accidents as fire in the air and the breaking of a propeller with damage to the plane. Gas and oil are extremely inflammable and the danger of fire is therefore ever present in planes. The relative locations of motors and gas tanks are of great importance. There is no position in which the pilot finds himself so helpless, and there is no spectacle that affects the morale of those seeing it, as the burning of a plane in the air. There are, however, quite a number of cases on record, in which burning planes landed and no injury to the personnel resulted, and also where fires in mid-air were extinguished by the occupants of the plane. Pyrene should be carried by every plane. Propeller accidents are quite frequent. A propeller may break in the air and portions of it pass through the wings or fusilage, not only damaging the plane to such an extent as to make further flight impossible, but also doing actual injury to the personnel. Cases are on record in which pilots were rendered unconscious by portions of a broken propeller. Well remembered is the accident of last year which occurred to a civilian plane flying between Miami, Fla., and one of the adjacent islands, in which the propeller broke forcing the plane down in a rough sea. All the passengers, four in number, were lost, and the pilot was picked up unconscious, tied to a piece of wreckage.

Chart No. 2.

	1917	1918	1919	1920	1921	Total.
Total number of injured	26	298	96	56	61	537
Fatalities and causes:						
Burns	2			3	5	10
Drowning	4	36	21	12	13	86
Fall and crushing	1	60	16	11	8	96
Explosion		6	2			8
Total	7	102	39	26	26	200
Percentage of deaths per year from different causes:						
Burns	28.58			11.54	19.23	
Drownings	57.14	35.29	53.85	46.15	50.00	
Fall and crushing	14.28	58.83	41.03	42.31	30.77	
Explosion		5.88	5.12			
Percentage of death to injured	26.9	34.2	40.6	46.4	42.7	

The percentage of death to the injured for the five year period 1917–1921 was 37.24 per cent, divided as follows:

	Per cent.
Burns	**1.86**
Drowning	**16.01**
Fall and crushing	**17.87**
Explosion	**1.50**
Total	37.24

The total number of deaths for the five year period 1917–1921 was 200, divided according to percentage as follows:

	Per cent.
Burns	5
Drowning	43
Fall and crushing	48
Explosion	4
Total	100

Statistics of the United States Navy from 1917–1921.—In chart No. 1, the statistics regarding injuries to aviation personnel from 1917 to 1921 inclusive are given. In chart No. 2, it will be seen that the total number injured for the entire five year period was 537, out of which 200 died. They were either killed at the time of the crash or died a short time afterwards.

It will be seen at a glance, that 43 per cent of the total number of deaths were due to drowning, and 48 per cent were due to multiple injuries caused by fall and crushing. It is surprising to note that only 5 per cent were caused by fire and burns; the total number of deaths from burns being only 10 in five years, and half of these were the result of the *ZR–2* disaster. I believe this is a remarkable record and speaks well for the mechanical construction and the precautions taken against fire. It would be well to bring this fact to the attention of all pilots in the service, as injury from fire is dreaded more than any other, and one hears of lots of stories of how one plane or another caught fire in the air. One prominent

Digitized by Google Original from UNIVERSITY OF MICHIGAN

factor stands out in these statistics, namely, the largest percentage of fatalities of any individual cause are from fatal submersion or drowning. While in the charts noted above, fall and crushing gives 48 per cent of the total fatalities, this figure includes practically all other injuries, as will be seen from chart No. 1.

The high percentage of deaths from drowning teaches a lesson, namely, provision for rendering prompt first-aid to those unfortunate pilots who are pinned in the wreckage. This will be discussed under prevention. The percentage of deaths to the number of injured during the five year period was 37.24 per cent, a little over one-third. In other words, out of every three crashes with injury, one crash was fatal. However it is to be understood that the above statistics do not include all crashes. They only include those crashes in which injuries or fatalities occurred.

During the year 1921, in which we had 26 deaths, there were 1,498 officers and men who took one or more flights. During this period there were 61 injuries, making the annual admission rate per thousand for injuries 40.72 and the annual death rate per thousand 7.36. In that year, 42.7 per cent of those who were injured died, and 50 per cent of all deaths were caused by drowning. Up to the year 1921, statistics in the United States Navy were kept, as shown above. For the year 1922, the Bureau of Aeronautics kept accurate accounts, not only of the injuries, but also of the number of men who took flights, the number of hours in the air, as well as the total number of flights made during the year.

Analysis of Airplane Crashes in the United States Navy during the Fiscal Year 1922.

(The total number of crashes reported was 108, in which 15 were killed and 8 seriously injured.)

	Flying hours.	Crashes.	Killed.	Seriously injured.
NAVY.				
Atlantic Fleet	2,775	5	0	0
Pacific Fleet	6,905	12	1	0
Anacostia	1,287	9	3	0
Coco Solo	968	0	0	0
Dahlgren	273	0	0	0
Great Lakes	62	0	0	0
Hampton Roads	2,516	12	1	1
Newport	144	0	0	0
Pearl Harbor	447	0	0	0
Pensacola	13,266	28	3	5
San Diego	2,931	14	1	2
Langley detachment	757	0	0	0
Total	32,331	80	9	8

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Analysis of Airplane Crashes in the United States Navy during the Fiscal Year 1922—Continued.

	Flying hours.	Crashes.	Killed.	Seriously injured.
MARINES.				
Parris Island	95	2	0	0
Guam	429	0	0	0
Port au Prince	1,661	5	0	0
Quantico	2,744	14	6	0
Santo Domingo	2,078	7	0	0
Total	7,007	28	6	0
Total Navy	32,331	80	9	8
Total Marines	7,007	28	6	0
Grand total	39,338	108	15	8

CAUSES OF CRASHES.

Hazards of operation.

Bad landing	25	Glassy water	2
Spin	15	Bad take-off	1
Collision	6	Poor pilotage	1
Taxi-ing (collision on water)	6	Spiraled into water	1
Side slip	5	Failure to recover from deliberate spin	1
Weather conditions	4	Skid	1
Burning of plane (in air)	1	Total number due to hazards of operation	76
Burning of plane (on ground)	1		
Gasoline exhausted	2		
Nose dive	2		
Stall	2		

Engine failure.

Structural	5	Not known	2
Loss of oil pressure	4	Overheating	1
Stoppage in gas feed	3	Total number due to engine failure	17
Ignition system	2		

Structural failure.

Pontoon	4
Hull	1
Landing gear	1
Rib	1
Total number due to structural failure	7
Not known	8

Total number of crashes, 108.

	Number of crashes.	Percentage of total.
Hazards of operation	76	70
Engine failure	17	16
Structural failure	7	6½
Not known	8	7½
Total	108	100

One death per 3,278 flying hours.
One death or serious injury per 1,967 flying hours.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CAUSES OF CRASHES BY ORGANIZATIONS.

Atlantic Fleet.

Gasoline exhausted	1
Bad landing	1
Poor pilotage	1
Weather conditions	1
Not known	1
Total number of crashes	5

Pacific Fleet.

Bad landing	5
Collision	2
Engine failure (structural)	1
Structural failure (rib)	1
Not known	3
Total number of crashes	12

Anacostia.

Collision	2
Bad landing	2
Engine failure (loss of oil pressure)	2
Spin	1
Side slip	1
Structural failure (pontoon)	1
Total number of crashes	9

Hampton Roads.

Bad landing	5
Spin	2
Stall	1
Glassy water	1
Engine failure (overheating)	1
Engine failure (stoppage in gas feed)	1
Not known	1
Total number of crashes	12

Pensacola.

Spin	9
Bad landing	3
Nose dive	2
Structural failure (pontoon)	2
Engine failure (structural)	2
Skid	1
Side slip	1
Bad take-off	1
Stall	1

Pensacola—Continued.

Glassy water	1
Spiraled into water	1
Failure to recover from deliberate spin	1
Taxi-ing (collision in water)	1
Structural failure (hull)	1
Not known	1
Total number of crashes	28

San Diego.

Taxi-ing (collision on water)	5
Bad landing	3
Spin	3
Structural failure (pontoon)	1
Side slip	1
Burning of plane (in air)	1
Total number of crashes	14

Parris Island.

Engine failure (stoppage in gas feed)	1
Engine failure (ignition system)	1
Total number of crashes	2

Port Au Prince.

Engine failure (loss of oil pressure)	2
Side slip	1
Engine failure (structural)	1
Engine failure (cause unknown)	1
Total number of crashes	5

Quantico.

Bad landing	4
Collision	2
Burning of plane (on ground)	1
Weather conditions	1
Gasoline exhausted	1
Engine failure (stoppage in gas feed)	1
Engine failure (loss of oil pressure)	1
Engine failure (structural)	1
Not known	2
Total number of crashes	14

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CAUSES OF CRASHES BY ORGANIZATIONS—continued.

Santo Domingo.		*Santo Domingo*—Continued.	
Bad landing	2	Structural failure (landing gear)	1
Weather conditions	2	Engine failure (cause unknown)	1
Side slip	1	Total number of crashes	7

In arranging these crashes in accordance with the classification given in another part of this article, we arrive at the following statistics: (Error in judgment is included under physical and mental defect.)

	Physical and mental defect.	Insufficient knowledge.	Mechanical or structural.	Weather condition.	Unavoidable.	Unknown.	Total.
Atlantic Fleet	2	1		1		1	5
Pacific Fleet	7		2			3	12
Anacostia	4	2	3				9
Hampton Roads	9		2			1	12
San Diego	12		1		1		14
Parris Island			2				2
Port au Prince		1	4				5
Quantico	7		3	1	1	2	14
Santo Domingo	3		2	2			7
Pensacola	16	6	5			1	28
	60	10	24	4	2	8	108

The above figures speak for themselves. Except for the United States Naval Air Station, Pensacola, no allowance can be made for a bad landing, collision, side slip, bad take-off, spin, or poor pilotage. Pilots of experience should know how to get a machine out of a spin, and students should not be allowed to solo until they know how to handle a plane in a spin.

Statistics of crashes in the United States Army Air Service.—The statistics and charts given previously for the crashes in the United States Naval Aviation Service referred to a large degree to seaplanes. During the period of 1917–1921 most of the flying in the United States Navy was carried on in seaplanes.

With the construction of airplane carriers and the use of their decks for taking off and landing, land planes will be used altogether, not mentioning the numerous other activities in which the Navy is now engaging land planes. The statistics of the United States Army Air Service are therefore of immense importance to the Navy.

A total of 1,250 crashes was reported in the United States Army from various flying fields from the beginning of the war in 1917 up to January, 1920. While these crash returns are incomplete, owing to the fact that many fields did not report their crashes, it is thought that the 1,250 reports are representative and show valuable data

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

bearing on the causes leading up to the crashes, injuries suffered by the pilot, extent of damage to plane, and other information of interest. According to the nature of the crash 1,211 are listed as follows:

Nature of crash.	Number.	Per cent of total.
Bad landing	563	46. 48
All spins	160	13. 21
Collision (other than with ship)	120	9. 90
Stall (engine trouble)	97	8. 00
Side slip	64	5. 28
Burning of plane	58	4. 78
Taxing (collision on ground)	49	4. 04
Nose dives	46	3. 79
Collision (in air with ship)	45	3. 71
Unknown	9	. 81
Total	1, 211	100

A summary of crashes, as given by the United States Army, according to cause, is shown below:

Cause of crash.	Number of crashes.	Per cent of total.
Bad judgment	594	47. 52
Engine trouble	263	21. 04
Unavoidable	225	18. 00
Inexperience	45	3. 60
Body of plane	37	3. 96
Vertigo	12	. 96
Acute physical impairment	10	. 80
Chronic physical impairment	3	. 24
Unknown	61	4. 88
Total	1, 250	100

Classifying these crashes according to causes given by the writer, we arrive at the figures given herewith:

	Physical and mental defect (bad judgment).	Insufficient knowledge.	Mechanical structural failure.	Weather conditions.	Unavoidable.	Unknown.	Total.
Number	622	45	300	----	225	58	1, 250
Percentage	49. 8	3. 59	23. 94	----	17. 91	4. 86	100

The above classification was made by the writer in accordance with his views concerning the causes of crashes. It is perfectly obvious that much depends upon the viewpoint of the person mak-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ing the special crash reports. In studying in detail the reports given by the Army, the above classification was worked out. Practically 50 per cent of the crashes were due to physical and mental defects and bad judgment. This figure corresponds very closely to that of the Navy. It is believed that these figures for the Army as well as the Navy, are still too low; and if a complete and thorough analysis could be made of each crash, the percentage of crashes due to physical and mental defects, including error in judgment, would be still higher.

In the Army's reports, 594 crashes are given as a result of bad judgment and 225 as unavoidable. It is believed that the number of crashes given as unavoidable is entirely too high and some other cause and explanation should have been given. This statement is verified by the reports of the Army Crash Board and the Army flight surgeons, which reports are not in accord, showing that evidently some differences of opinion and doubt as to the cause of the crashes existed.

Taking up the question of age and its possible bearing on the cool judgment and resourcefulness so necessary in the case of a flier, it is interesting to note that the percentage of crashes attributed to bad judgment on the part of the pilot shows a steady decline from the young pilot of 18 or 20 to the more mature judgment of the flier of 30 to 35 years of age. In reverse ratio is the percentage of crashes listed as unavoidable, which shows a percentage of only 12.08 of all crashes occurring among pilots from 18 to 20 years, and rises to 26.81 per cent of all crashes among pilots from 27 to 30 years of age.

Number of crashes and percentages of total, in which the cause was shown as bad judgment or unavoidable, are given below:

Age of pilot.	Cause of crash.			
	Bad judgment.		Unavoidable.	
	Number.	Per cent of total.[1]	Number.	Per cent of total.[1]
18 to 20 years	34	58.63	7	12.08
21 to 25 years	226	51.71	70	16.02
24 to 26 years	166	44.12	67	17.91
27 to 30 years	91	41.36	59	26.81
31 to 35 years	25	40.98	14	22.95
36 to 40 years	6	50.00	----------	----------
41 to 45 years	3	60.00	1	20.00
Unknown	43	53.09	7	8.64
Total	594	47.52	225	18.00

[1] Percentage of total crashes chargeable against each age group.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Brief summary of injuries by type of plane is given herewith.

Type of plane.	Killed.	Injured.	Uninjured.	Unknown.	Total.
Curtiss	105	269	669	3	1,092
De Haviland	13	19	52	2	96
Scout	7	5	4		16
Foreign	5	8	22		35
All other	5	1	10		16
Unknown		1	4		5
Total	135	303	807	3	1,250
Percentage	10.80	24.24	64.56	0.40	100.00

It is remarkable to note that in 1,250 crashes only 10.89 per cent of the personnel were killed and 24.24 per cent were injured, and 64.56 per cent escaped without any injury. This is rather an exceptional record. It is believed, however, that those classified as uninjured, had some sort of slight injury, not sufficient to take the pilot off the flying list. The writer has seen a great number of accidents in the Navy and in practically every case, some sort of an injury was sustained.

It is interesting to note the distribution of fliers by age for the year 1918, as published by the Army.

A Distribution of Fliers by Age for the Year 1918.

Age.	Per cent of total.	Age.	Per cent of total.
19 years	0.5	29 years	4.5
20 years	4.9	30 years	3.6
21 years	8.9	31 years	2.2
22 years	12.7	32 years	1.2
23 years	13.7	33 years	.6
24 years	12.9	34 years	.5
25 years	11.8	35 years	.2
26 years	10.0	36 years	.3
27 years	6.8		
28 years	5.8	Total	100.00

In the year 1920, the United States Army Air Service had a total number of crashes of 312 and in 1921, a total of 330, distributed as follows (author's classification):

Physical and mental defects	46
Insufficient knowledge and experience	6
Mechanical imperfection of plane or motor	56
Weather conditions	6
Unavoidable causes	24
Unknown	70
No crash board	104
Total	312

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

In the total of 312 crashes listed above, 34 were killed, giving a percentage of 10.89, 13 were severely injured and 48 were slightly injured, giving a percentage of 19.87.

The total number of pilots in the Army Air Service in June, 1920, was 720, and on December 31, 1920, the number was 580. The average number for the year 1920 is 650. Therefore, 5 23 per cent of all pilots were killed; 9.38 per cent of all pilots were injured.

A total of 14.61 per cent of all pilots were either killed or injured. There were 650 officers as an average for the year and 312 crashes. Practically one out of every two officers had a crash in 1920.

Statistics of the United States Army for the year 1921.

Physical and mental defects	59
Insufficient knowledge and experience	1
Mechanical imperfection of plane or motor	41
Weather condition	12
Unavoidable causes	29
Unknown	27
No crash board	161
Total	330

Of the 330 crashes listed above, 38 were killed, or 11.54 per cent; 40 slightly injured, 14 severely injured, or 16.36 per cent.

The total number of pilots in the United States Army on December 31, 1921, was 861 air service officers with flying ratings. Out of 861 air service officers, 330 must have crashed. It is noted that among those crashed were 13 enlisted men, which would make 317 crashes by officers, or 36.8 per cent of all officers of the Regular Army with flying ratings, had a crash in 1921. In other words, one out of every three had a crash. Taking the officer personnel of 861, it will be noticed that 4.41 per cent were killed and 6.27 per cent were injured, making a total of 10.68 per cent either killed or injured, which is lower than the figures of 1920.

Crashes according to rank of pilot.

	Crashes.		Crashes.
Not given	1	Lieutenant colonel	4
Enlisted	13	Foreign officer	5
Cadet	62	Marine Corps officer	2
Second lieutenant	31	Naval officer	1
First lieutenant	147	Total	330
Captain	43		
Major	21		

The results of crash for passengers in the United States Army Air Service were as follows:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Result of crash for passengers.

	Passengers.		Passengers.
No passengers	100	Severely injured	13
Uninjured	185	Killed	31
Slightly injured	26		
		Total	355

There were six passengers, including two civilians, killed in one crash, and also one passenger severely injured and one (civilian) killed in one crash. One other civilian passenger was killed, making a total of four civilians killed who were flying as passengers in Army airplanes. Three passengers were killed and one severely injured in a single crash, and in another crash two passengers were killed.

Statistics of accidents in the American Expeditionary Forces during the World War.

Fatalities at the signing of the armistice:	
Killed in combat with enemy	169
Killed while training	203
Killed in accident at the front	42
Total	414

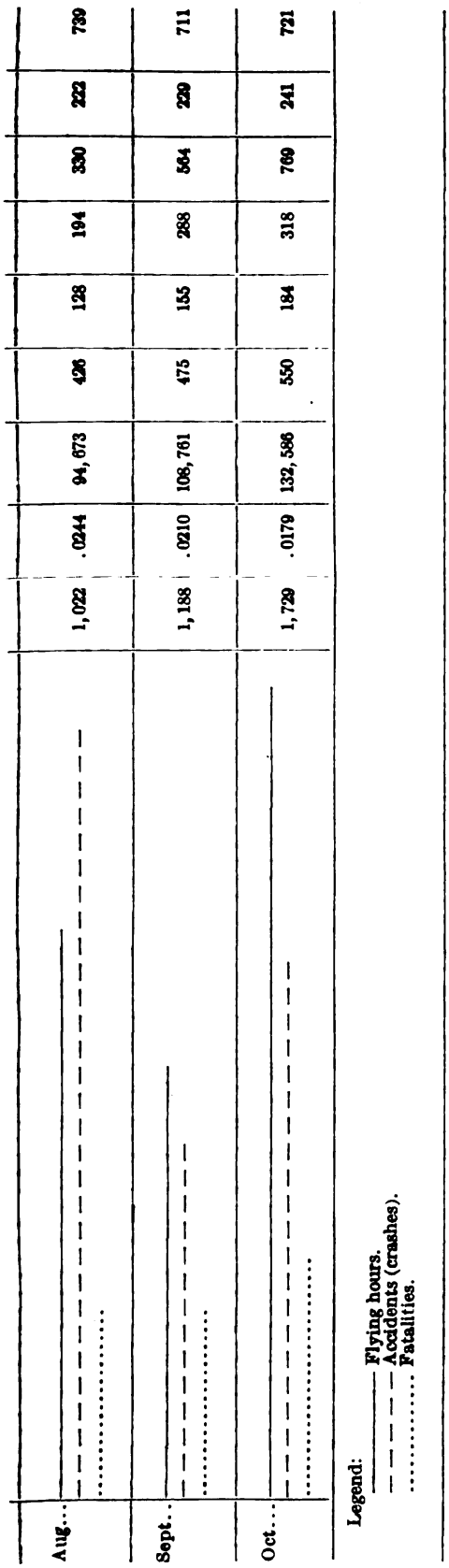
Prior to the signing of the armistice, there had been listed in all 5,646 pilots and observers in the American Expeditionary Forces, of whom 2,141 were still under training. The following chart presents the comparison of the flying hours, accidents, and fatalities for the training centers of the American Expeditionary Forces from January until the end of October, 1918. The number of crashes was 550, and of fatalities 184. The number and extent of injuries sustained by pilots in crashes are not given, but it is reasonable to presume that most of them received some sort of injury, varying in degree, from which they recovered. During the first part of the year, the fatalities were relatively small, and for some unknown reason they doubled in May and quadrupled in August. The average number of flying hours per crash showed a marked progressive decrease after April, whereas the number of average flying hours per fatality showed a general tendency to increase, 721 hours per fatality in October as compared with 464 in January. (See chart No. 3.)

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CHART 3.—*Comparison of flying hours, accidents (crashes) and deaths of pilots and passengers.*

Flying hours.	Number students per month under training.	Average monthly fatalities.	Totals to date.			Number flying hours per month.		Average number flying hours to date.	
			Flying hours.	Crashes.	Fatalities.	Per crash.	Per fatality.	Per crash.	Per fatality.
Jan.	611	0.0116	5,563	10	12	525	464	525	464
Feb.	603	.0180	11,400	19	23	650	531	640	496
Mar.	678	.0148	19,828	32	33	647	842	635	607
Apr.	1,365	.0073	32,112	51	43	648	1,228	630	749
May.	1,465	.0170	46,491	148	68	150	575	514	684
June.	1,242	.0161	61,237	244	88	154	737	251	696
July.	1,143	.0131	70,450	322	103	173	1,013	220	742

Digitized by Google
Original from UNIVERSITY OF MICHIGAN



	1,022	.0244	94,673	426	128	194	330	222	739
	1,188	.0210	106,761	475	155	288	564	229	711
	1,729	.0179	132,586	550	184	318	769	241	721

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Casualties at the American front.

Killed in combat	137
Missing	59
Prisoners	119
Killed in accident	40
Died of disease	2
Wounded	109
Interned	3

Casualties of the American fliers with the Allies.

Killed in combat	32
Missing	13
Prisoners	17
Killed in accident	2
Died of disease	2
Wounded	18

Summary of American casualties at the front.

	American Expeditionary Forces.	With Allies.	Total.
Killed in combat with enemy	137	32	169
Killed in accident	40	2	42
Missing	59	13	72
Prisoners	119	17	136
Interned	3		3
Died of disease	2	2	4
Wounded	109	18	127
Total	469	84	553

Lieut. Col. L. G. Rountree, Medical Corps, United States Army, who completed the statistics for the American Expeditionary Forces, makes the following comment:

Statistics such as these indicate the enormity of the problem. When it is realized that for every 100 trained pilots leaving the training institutions of France for work at the front, 15 had succumbed to accidents in training; that in October, 1918, when our training schools were at the maximum of efficiency, a crash occurred in the school of the American Expeditionary Forces for every 241 hours flown and a fatal accident occurred for every 721 hours flown, the importance of the accident problem becomes manifest. When it is further realized that many of the student fliers entering the school in France had been already trained in the United States, and that even a larger number had already succumbed to accidents in training there, the problem assumes even greater importance. Finally, when it is realized that one man was killed by accident for every three trained pilots arriving at the front, and that three fliers were killed in accidents for every one killed in combat, the accident problem establishes itself as the most important medical problem of aviation.

Comparison of Army, Navy, and Expeditionary Forces.—In comparing the Army and Navy crashes from 1917 to 1921, inclusive, we obtain the following data:

Digitized by Google Original from UNIVERSITY OF MICHIGAN



Fig. 8.—CRASH IN NOSE DIVE.

Digitized by Google
Original from
UNIVERSITY OF MICHIGAN

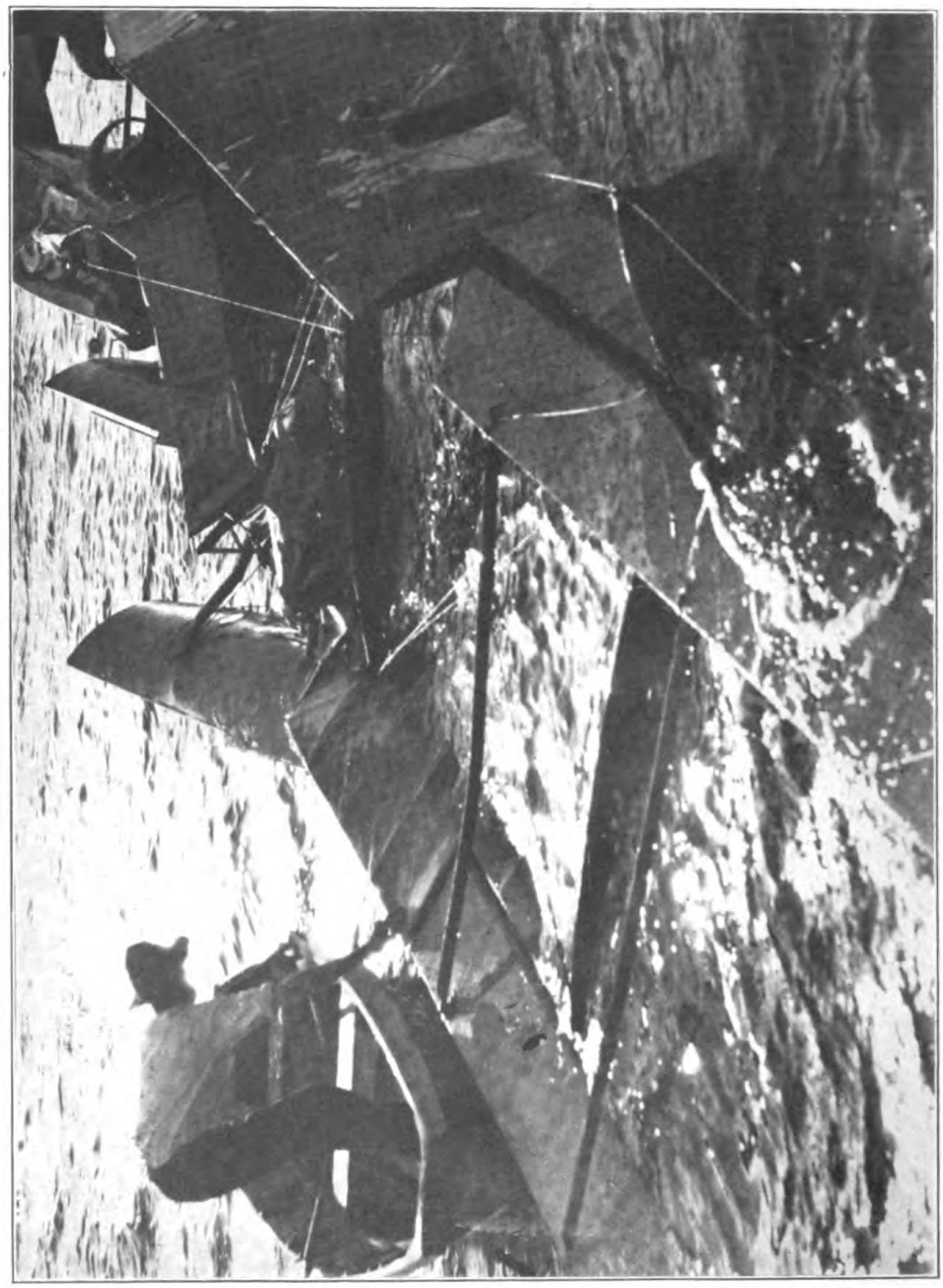


Fig. 9.—CRASH OF R 9 TYPE OF SEAPLANE, ILLUSTRATING THE DIFFICULTY OF EXTRICATING THE PASSENGERS FROM THE WRECK, AND THE NECESSITY OF WEARING LIFE JACKETS WHEN FLYING OVER WATER.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

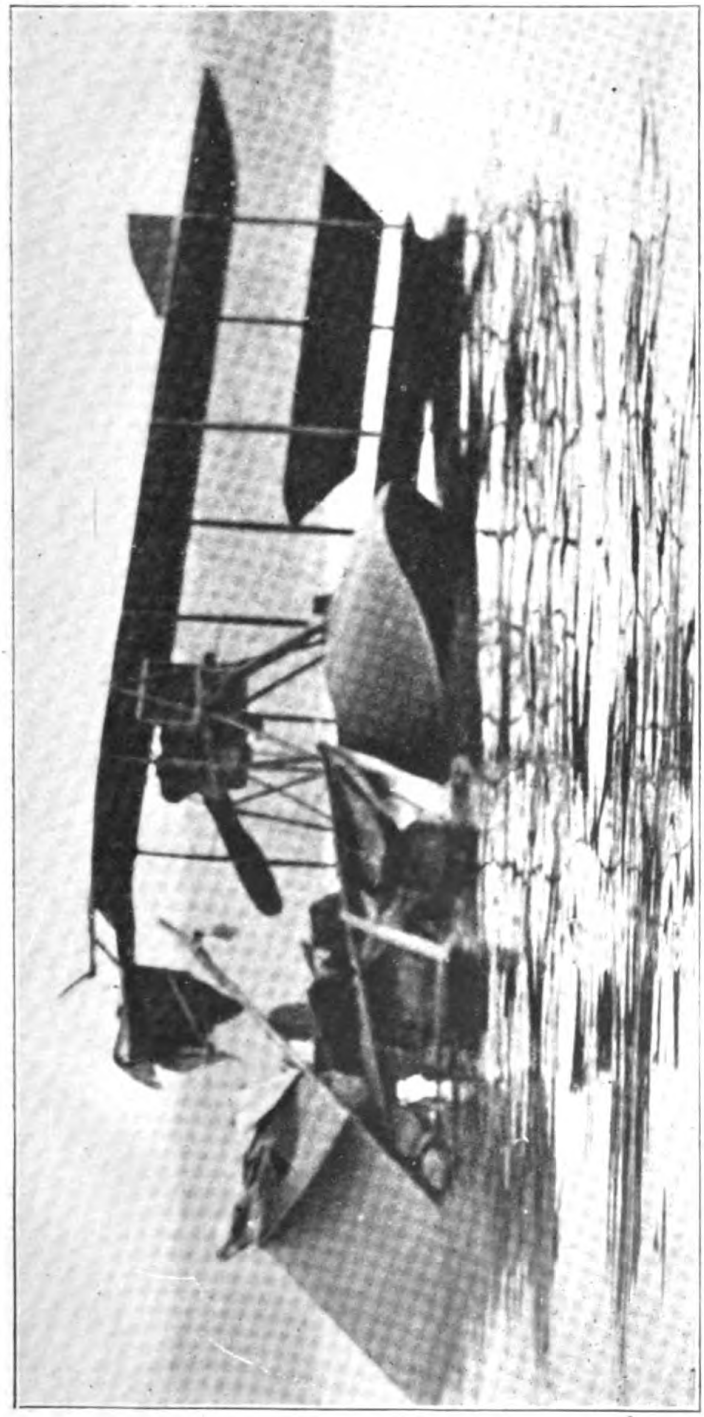


Fig. 10.—F-BOAT CRASH, THE RESULT OF A TAIL SPIN. AVIATOR NOT INJURED.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Fig. 11.—LAND PLANE AFTER A FORCED LANDING AT SEA. NOTE THE PROJECTING TAIL WHICH IS CHARACTERISTIC OF THIS TYPE.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

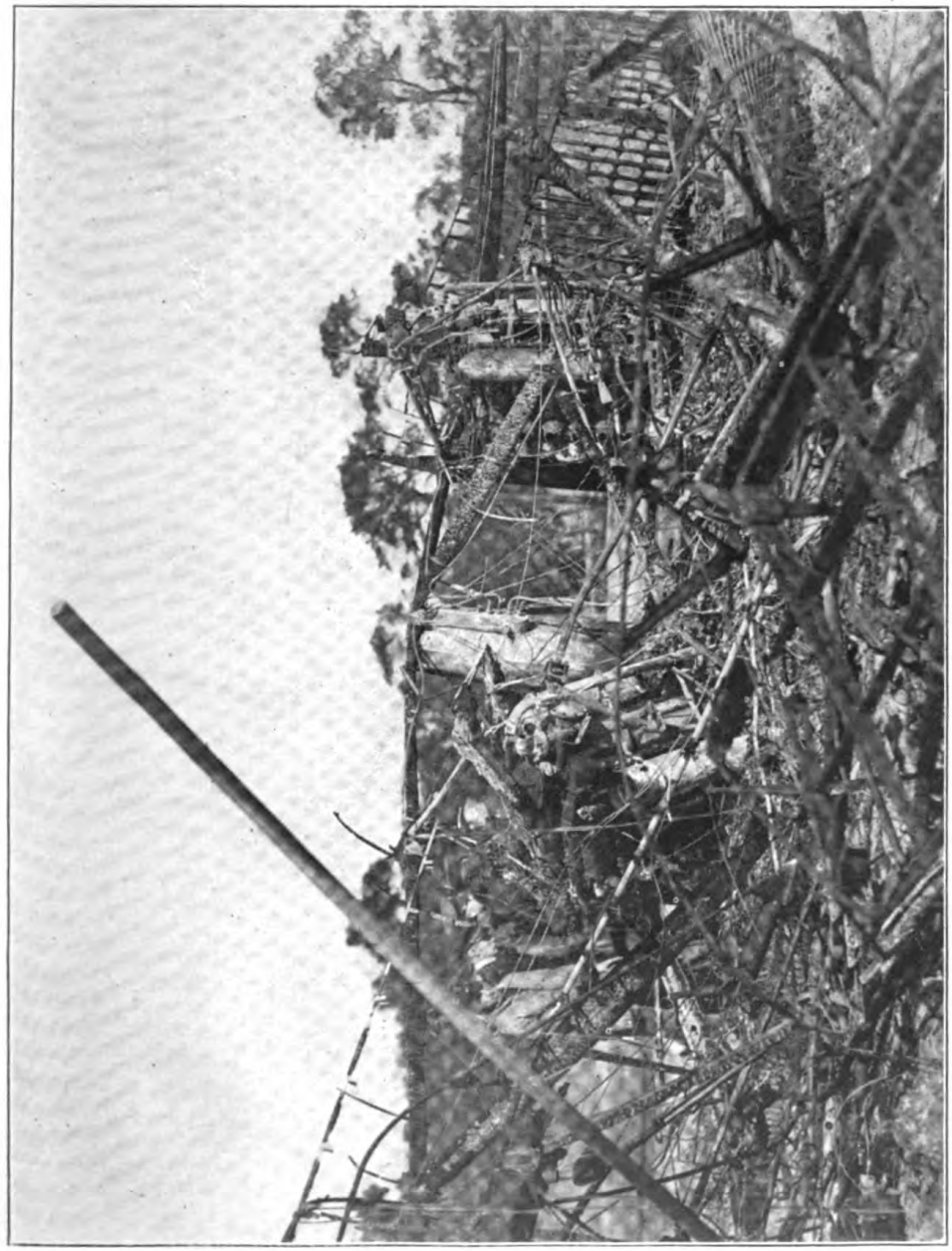


Fig. 12.—PLANE WRECKED AND BURNED AS THE RESULT OF HITTING A HIGH-TENSION ELECTRIC WIRE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Fig. 13.—CRASH OF SEAPLANE. PILOT PINNED UNDER THE WRECKAGE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

ARMY.

	1917-1919	1920	1921	Total.
Pilots:				
Killed	135	34	38	207
Injured	303	61	54	418
Passengers:				
Killed	Not given.	12	31	43
Injured	Not given.	56	39	95
Total	438	163	162	763

NAVY.

	1917	1918	1919	1920	1921	Total.
Killed	7	102	39	26	26	200
Injured	26	298	96	56	61	537
Total	33	400	135	82	87	737

A. E. F. (AMERICAN EXPEDITIONARY FORCES).

	During the World War.
Killed	414
Injured	127

Total of actual trained pilots.

	Killed.	Injured.	Total.
Total Army, 1917–1921	207	418	625
Total Navy, 1917–1921	200	537	737
Total, A. E. F. (during war)	414	127	541

The figure 127, under injured, is the number wounded at the front and does not include injuries to the pilots while training at air stations in France. The total number of injuries could not be obtained.

Mail service and civilian aviation activities.—In the United States two other activities could be taken into consideration when considering aviation accidents, namely, the United States Mail Service and civilian aviation activities. However, the statistics of accidents and fatalities of the above organizations are not of importance to the military and naval units, as the flying carried on by these units is of an entirely different character. Military tactics require a close formation of airplanes in bombardment, observation, and photographic flights. Stunt flying is compulsory in training for combat, pursuit, and scout work. Reconnaissance and cross country flights

Digitized by Google Original from UNIVERSITY OF MICHIGAN

are necessary in unfamiliar territory. In commercial aviation there is never any necessity for flying in formation, and in cross country flights the pilot is familiar with the territory, as he has gone over it numerous times and he knows that such and such a place would make an excellent landing field and a possibility of collision with other planes is practically nil.

The writer, however, does not wish to be misunderstood. Flying of any kind is always dangerous. The United States Mail Service pilots have done a wonderful lot of flying. They are often compelled to fly in stormy weather and in fog. Mountain ranges are traversed, the Alleghanies, the Rockies, and Sierras, over which may be found the worst possible flying conditions.

Statistics as to the injuries and fatalities in the United States Mail Service are not at hand. The aircraft yearbook gives the forced landings of the Air Mail Service from 1918–1922. The forced landings are given under two causes, namely, mechanical failure and other causes.

Forced landings United States Mail Service.

	Mechanical causes.	Other causes.
1918	22	24
1919	69	97
1920	434	385
1921	632	841
1922	206	367
Total	1, 374	1, 741

It would be interesting to know how many fatalities and how many injuries resulted from these forced landings. These data were not available at the time of writing of this article. It is stated that during the 12 months ending July 18, 1922, the United States Mail Service operated without a single serious accident. This is indeed a remarkable achievement in flying.

Different, however, is the story of civilian activities, and these pilots were not quite as fortunate, although they have done remarkably well, considering the circumstances under which they operate. The Aircraft Year Book of 1923 gives the following statistics for 1921 and 1922.

	1921	1922
Accidents	114	126
Fatalities	49	62
Injuries	89	100
Total	252	288

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It is estimated that during the year 1921, 1,200 aircraft were engaged in civil flying in the United States and that these flew 6,500,000 miles and carried 250,000 persons. It is interesting to note the statement made regarding the accidents in 1921, by the editor of the Aircraft Year Book, the statement coinciding with the views expressed by the writer in this as well as other articles:

> Each of the 114 accidents was caused by deficiency in one or more of the six necessary requisites of safe flying. Forty-nine were attributed directly to the pilot, perhaps through carelessness, perhaps incompetence, perhaps bad judgment combined with other factors.

There is no doubt that a good pilot can guide a poor machine to safety with greater chance of success than a poor pilot can operate a first-class aircraft. Therefore, at the very top of the list of governmental needs is the Federal examination and licensing of pilots The knack of flying can not be retained perpetually without practice, nor can it be maintained at a high degree of competency without regular examination on a common standard for all flying throughout the United States. The same is true of aerial navigators. Both pilot and navigator are of equal importance in safeguarding the lives of travelers by air.

The writer believes that the low percentage of fatalities and injuries in both activities, air mail and civilian aviation, are due to the fact that most of these pilots are ex Army or Navy fliers who have had a great number of hours in the air and a lot of experience in flying. Furthermore, the Army and Navy have to train constantly new men for flight duty, and during this training a great number of accidents occur, it being the most dangerous time. It is believed that this fact accounts for the greater number of fatalities in military and naval aviation.

Of the 114 accidents in civilian aviation, 29 occurred during stunting; 20 persons were killed and 36 injured in these 29 crashes, more than 40 per cent of the total casualties. Stunt flying in unrestricted areas was responsible for almost as many casualties as all other elements combined.

The writer has heard many persons in the service as well as in civilian life criticize pilots for stunt flying and he therefore does not want to let this point pass unnoticed. Stunt flying is just as necessary to a military or naval pilot as is straight flying. All pilots, military and civilian, must know how to stunt and should practice stunting at repeated intervals. If they do not know stunting they are going to meet sooner or later with disaster. But the habit of stunting for thrills and the use of planes not suited for stunting sooner or later spells disaster. Stunting should be practiced with certain types of planes, at certain altitudes and over certain areas, preferably over specified flying fields where a safe landing can be reasonably expected.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

SUGGESTIONS FOR THE PREVENTION OF ACCIDENTS AND FATALITIES.

The duties of the flight surgeon in aviation units are, first, prophylaxis or measures for the prevention of accidents and fatalities; and, second, the surgical and medical care of the personnel in case of accident and injury. To fulfill these functions successfully is one of the problems of military medicine of to-day. To reach the stage where the human defects of the aviator, physical and psychological, can be entirely eliminated by practical and applicable tests is an achievement which many of us are striving to accomplish. The problem will involve an infinite amount of work, study, personal sacrifice, and diligence on the part of those engaged in this duty. Persons in aviation accidents often sustain multiple and mutilating injuries, and to repair them or even save the lives of the injured involves skill and knowledge of the most up-to-date surgical principles.

It was seen by the statistics that practically 50 per cent of all deaths in naval aviation within five years were due to drowning. It is therefore obvious that an efficient first-aid force is one of the prime requisites of an active aviation organization, and it must be equipped with rapid means of transportation to reach the scene of accident with the least possible delay and return in the same manner. Let us therefore consider the organization of the medical unit with an aviation organization.

First of all, each aviation organization, depending upon its size, must have one or more flight surgeons. This flight surgeon must be thoroughly trained in aviation medicine and aviation problems and he must be willing to fly with the pilots. Only in this manner can he obtain a broad aspect of the emotions, hardships, and difficulties which a pilot in an active organization experiences. To assign a medical officer to an aviation unit who for reasons of his own is not willing to fly, and who is not enthusiastic about aviation, is a mistake, bound to have disastrous consequences. The duties of the flight surgeon in connection with the complicated physical examination and the maintenance of the pilot in perfect physical condition have been described by many writers and are well known.

One of the prime necessities for an aviation ship or an air station is an efficient alarm system. At most of the air stations large wooden or steel towers, similar to radio towers, are constructed, on the top of which is a housing for the lookout. A bell system connects the lookout with the speed boat or sea sled, the ambulance, and the sick bay. The lookouts are constantly on duty during the time

Digitized by Google Original from UNIVERSITY OF MICHIGAN

when flying is carried on and they are in communication by telephone with the hangars and flight office. As soon as a plane takes the air, the number and the type of plane is transmitted to the lookout. The lookouts are equipped with field glasses and are thoroughly instructed regarding their duties. These lookouts are of the greatest importance, and good reliable men should be selected for this duty. The towers are indispensable, especially at a training station, where all flying in training is carried on in the vicinity of the towers. The student can be carefully watched from this point and from it he receives his signals as to weather conditions, change of wind, and recall to the hangar. In case of a crash, the lookout notifies by means of a bell system, the sick bay, the speed boat, and the ambulance. All three must immediately respond and no excuse must be accepted for their delay, except an unavoidable cause, such as a mechanical failure of the boat or ambulance. A delay on the part of the personnel must not be tolerated. At the air station, Pensacola, where all the naval personnel receives its training, a speed boat is constantly on duty in the bay, secured to a buoy in the center of the course, around which the students fly, ready to go to a student's assistance at a moment's notice, and these boats have saved the lives of many officers and men. The speed boats have in addition to the crew, which is thoroughly instructed in first-aid measures, a reliable pharmacist's mate. He has with a him a hospital corps pouch, a Stokes stretcher, a pulmotor for resuscitation in case of apparent drowning, a tool kit, and a number of cylinders containing pyrene. The ambulance is stationed in the vicinity of the sick bay, and as soon as the crash alarm is given a stretcher party in charge of a medical officer proceeds to the scene of accident. The ambulance is of special importance on stations where land plane flying is being carried on, and the equipment should be the same as the speed boat with the exception of the pulmotor. The hospital corps must be thoroughly instructed in stretcher and first aid work and the crash organization of the Medical Department must be such that in case of accident no delay is encountered. When the crash alarm is given, the stretcher party must immediately secure the necessary equipment previously assigned to them and if one member of the party is absent for any reason on that day, another hospital corpsman must automatically step into his place. On stations where land plane flying is carried on, the fire department of the station must also be connected by an alarm system to the tower. On some stations chemical fire extinguishers are constantly kept within the vicinity of the flying field. If the field is a very large one, it should be divided into certain numbered areas

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

and the alarm should be given according to number. Every one will then know the approximate location of the crash.

Aboard aviation ships the organization is made up along the same lines. Lookouts are stationed on the bridge and a bell system is connected with the sick bay and the speed boat. It is advisable to have the sound of the alarm different from the one used for other drills on board, such as general and fire alarm. Life preservers are standard equipment in United States Navy boats, and in a crash it may become necessary for men to dive overboard to drag the exhausted pilot out of the wreckage. These life preservers should be repeatedly inspected and kept in good condition and in easily accessible places in the boat. The pulmotor is indispensable [1] and it also must be repeatedly inspected by the medical officer himself. The rubber in the bag has a tendency to rapid deterioration, especially at sea, and spare ones should be kept on hand. Without a good rubber bag the pulmotor is useless.

The first-aid bag, in addition to a surgical instrument set, must contain the following essential articles:

1. Morphine solution (ready for injection).
2. Aromatic spirits of ammonia.
3. Hypodermic tablets and sterilized hypodermic syringe.
4. Bottle of sterilized water.
5. Picric-acid solution, 1 per cent in strength.
6. Tourniquets, six in number.
7. A bottle of chloroform or a can of ether and a face mask.
8. Six large shell-wound dressings, six first-aid packages.
9. Sterile gauze and bandages.
10. A bottle of grain alcohol.

Regarding the alcohol, a great number of men who were in crashes and who have been in the water for some time invariably asked for some sort of drink. Alcohol makes a very unpleasant beverage, no matter in what manner it is administered, and it is believed that whisky would make a better substitute. Even admitting that alcohol may be just as good as whisky, as far as the physiological action is concerned, it tastes very bad and does not produce the same psychological effect as whisky, and the effect of the crash on the patient's mind is something to be reckoned with.

It must be remembered in making up the above first- aid outfit that as many as four or five persons may be injured in one crash. In addition to the pouches in the boat and in the ambulance, another one should be in readiness for the medical officer, should it become necessary for him to go to the scene of the accident by airplane.

[1] It is doubtful if the pulmotor is as advantageous as the Schaefer method of artificial respiration in the resusitation of the apparently drowned. [Ed.]

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The tool kits should contain the following:

1. Two strong wire cutters.
2. One saw.
3. Two crowbars.
4. One hammer.
5. Two axes.
6. One strong cloth-cutting scissors.
7. A long, strong knife.

These implements are necessary, as the pilot may be pinned under the wreckage, and difficulty is experienced in extricating him. Great caution must be exercised in doing so, as a simple fracture may be converted into a compound one by careless handling. In case of fire, this point must be disregarded and the man rescued without the slightest delay, regardless how extensive his injuries are. It is the only chance of saving him. While the first-aid organization of the medical department is at the scene of accident preparations must be made to receive the wounded in the operating room, where everything must be by previous arrangement in readiness to perform the most complicated surgical operation. Every available facility for treating a severe case of burn, such as warm bath with the necessary medicinal solution of bicarbonate of soda or acetic acid, must be got ready.

As stated above, it sometimes becomes necessary to go to the scene of accident by either a sea or land plane. The F5L type of plane can be very readily used to go to an accident at sea. It has plenty of room for carrying two Stokes stretchers. To go to a land-plane accident is not always possible, on account of the difficulty in landing. However, numerous land-plane ambulances are being developed in the United States, England, France, and Italy. The English are using these ambulances for expeditionary purposes. It is stated that France is organizing squadrons of air ambulances for rapid transportation and use in time of emergency.

Goggles.—The question of goggles in relation to the prevention of aviation accidents is a very important one. If the eyes of the flier are not properly protected his usefulness as a flier will soon be at an end, and improperly constructed glasses are liable to lead to crashes and disaster. A number of goggles are in use, but none of them are entirely satisfactory in every respect. An effort is being made at present by the Navy Department to obtain a satisfactory goggle. A board has been appointed by the Chief of the Bureau of Aeronautics and a letter was sent out to all aviation activities for comment on the recommendation of this board. The bureau's letter and the writer's answer are given below. They are self-explanatory.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

NAVY DEPARTMENT,
BUREAU OF AERONAUTICS,
Washington, D. C., 19 July, 1923.

From: The Chief of the Bureau of Aeronautics.
To: Commander Aircraft Squadrons, Scouting Fleet.
Subject: Standard goggles.

1. The bureau has decided to adopt a standard type of goggles for aviation, and has appointed a board which recommends two types:

(*a*) The present standard Navy goggles of resistal glass, except that a stiffener be placed in the webbing on the outboard side of each lens in order that the glass may be held away from the eyelashes.

(*b*) No. 6 gogglette, as supplied by Meyerowitz & Co., of New York, except that the cloth nose bridge be replaced by adjustable metal nose bridge as in the other type of gogglettes. Furthermore, the lenses should, if possible, be made flat instead of curved, and should be of resistal glass.

Before final decision, the bureau would like to have the opinion of the Commander Aircraft Squadrons.

2. It is requested that reply be expedited.

A. W. JOHNSON,
Captain, U. S. N.

By direction of the Chief of the Bureau.

U. S. S. "WRIGHT,"
Newport, R. I., August 19, 1923.

From: Medical officer, Aircraft Squadrons, Scouting Fleet.
To: Commander Aircraft Squadrons, Scouting Fleet.
Subject: Standard goggles.
Reference: BuAer Let.No.Aer-2-GB, 7-17, of July 19, 1923.

1. The Bureau of Aeronautics has appointed a board which has recommended two types of goggles, namely, the present standard type of resistal glass and No. 6 gogglette, Meyerowitz, both with certain changes.

2. As the commanding officer, U. S. S. *Wright*, has referred the letter mentioned in reference to this medical officer, he feels at liberty to express his views on this matter and set forth the type of goggles he considers best and the method by which they should be tried out and adopted for general use.

3. The board convened by the Chief of the Bureau of Aeronautics undoubtedly had considered all the advantages and disadvantages of all sorts of goggles and this officer therefore does not wish to go into all minor details of the structural make-up of them. But there are certain gross defects which are of great importance which if not corrected will eventually result in diminution of vision and improper muscle balance of the eyes in fliers. This fact was noticed by fliers in this aircraft squadron during their long flight to Panama and a number of pilots are still suffering from the effects of long continued wearing of improper goggles.

4. In the construction of goggles the following points should be taken into consideration.

(a) They should prevent strong currents of air coming in contact with the eyeball and its adnexa, should protect the eyes from dust, water and oil, insects, drying from wind, and exposure to cold. (If no goggles are worn, the strong air currents necessitate partial closing of the eyes and therefore causing a diminution in vision.)

(b) The lens should not obstruct the field of vision nor have any blind angles.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(c) The lens should be tinted, preferably yellow-green, as the colors absorb the light of short wave lengths and prevent ocular and nervous fatigue.

(d) The lens should be nonshatterable. (With this statement, however, not all authorities agree, for reasons described later.)

(e) The goggles must fit comfortably and should not cause undue pressure upon any portion of the head.

(f) They must have ventilating space in order to prevent the formation of vapor at ordinary altitudes and the frosting at high altitudes.

5. The goggles recommended by the board have some of the above requirements but not all of them. The writer is acquainted with both types mentioned and has worn them repeatedly on flights. The resistal type was worn by him on a long flight from Panama to Corrientes Bay, Cuba. It was noticed that these goggles caused undue pressure on the head and could not be adjusted in such a manner as to relieve the pressure. The pressure was especially marked over the bridge of the nose and on the supra-orbital ridge. They also decrease the field of vision to a more marked extent then is ordinarily realized by the pilot. In order to obtain a good side view, one must turn his head. While the angle may be small close to the eye, this angle increases the further it extends from the original field of vision, and this obstruction to the field may prove of grave consequence to the pilot during battle. This medical officer has discussed this particular point with numerous pilots and we tested it out during a flight and found that the difference between the field of vision without goggles and the field of vision with goggles (resistal type) was almost an inch at the side of the head. Another point of importance is that the present lenses tire the eyes greatly, which is either due to nonabsorption of short wave lengths or the improper focus of light rays, causing a fatigue of the eye muscle. This fatigue has been noticed by almost every pilot who has made a flight of long duration. (The pilots of the *NC4* in the trans-Atlantic flight spoke to the writer about this very point). Regarding the gogglettes No. 6, Meyerowitz, I do not consider them satisfactory under their present construction, their greatest disadvanage being rubber and metal fittings which are uncomfortable and which chill the eyes by radiation in cold weather and at high altitudes.

6. In view of the above, this medical officer recommends a goggle be constructed of the following type:

(*a*) Two large pieces of resistal glass (lens) inclosed in a metal frame reinforced by a large layer of wool padding. The lenses should be curved and large enough to obtain exactly the field of vision of the normal eye without lenses. The glass does not necessarily have to be of nonbreakable material, as experience has shown that injuries to the eyes when breakable glass is used are extremely rare. However, they can be made nonbreakable as an additional precaution, but it is not considered absolutely necessary. The lenses should have a yellow-green tint, but many pilots object to this coloring, claiming that they have difficulty in recognizing uniforms and in selecting the proper place in a forced landing. In such a particular case of emergency, the writer sees no reason why the pilot should not remove his goggles for a few minutes. Another point looms up in connection with the glass itself. The writer has noticed that many flyers have refractive errors, either myopic, hyperopic, or astigmatic. This condition is soon going to be of great importance to the Bureau of Aeronautics. It is a well-known fact in medicine that changes in accommodation take place with age. The question will then arise, will these pilots be allowed to fly with corrected glasses or are they to be relieved from flying? If the latter, it will be a distinct loss to aviation. It is believed that

Digitized by Google Original from UNIVERSITY OF MICHIGAN

a glass with the refractive error corrected could be worn by pilots, and the officers who have a small refractive error could have special glasses fitted for them, and while it is rather expensive, certainly would save their eyes and may prevent a serious accident. The writer wishes, however, to state emphatically that he is only referring to small refractive errors.

(*b*) The metal around the lens should be of the same material as used on the present type, but should be curved and fit closely to the lens.

(*c*) The nose bridge should be of metal and adjustable. This is a very important point, as the interpupillary distance varies with different individuals. The padding should be of wool, but thicker than in the present resistal goggle. This thick padding would prevent the glass from coming too close to the eye. A stiffener can be placed in the webbing on the outboard side of each lens, but it is believed that this stiffener will not prevent the pressure upon the inner side of the supra-orbital ridge, but a thick wool pad would prevent the pressure.

7. If the bureau intends to supply goggles which will ultimately be of the greatest value, it is recommended that a certain number of a certain type be constructed and these be sent to the air forces for a try out. If they are satisfactory, they could then be adopted for general use; and if not, such improvements as are advisable and necessary could be made. The writer does not believe that the goggles described in the bureau's letter will be entirely satisfactory nor much of an improvement over the present type of resistal glass. He recommends that a small number of goggles of various types be constructed and tried out by the pilots and flight surgeons and the one which proves most satisfactory be adopted. The writer wishes to emphasize that goggles are the most important equipment of an aviator, and this matter should be given deep consideration and some actual experiments should be conducted along this line.

J. F. NEUBERGER.

AIRCRAFT SQUADRONS, SCOUTING FLEET,
U. S. S. "WRIGHT," FLAGSHIP.
Newport, R. I., 25 September, 1923.

From: Commander Aircraft Squadrons, Scouting Fleet.
To: The Chief of the Bureau of Aeronautics.
Subject: Standard goggles.

1. Forwarded for the consideration of the bureau. The recommendations made by Lieutenant Neuberger (MC), United States Navy, in paragraphs 6 and 7 of his letter, to which this indorsement is appended, are concurred in. It is requested that the bureau take action accordingly.

W. R. GHERARDI.

Ear protection.—The best method of protecting the ear during flying is still a question, although many devices and substances are being used and have proved quite satisfactory. A number of pilots do not use any protection for the ears, which practice, it is believed, will eventually result in injury to the ear, especially in flying twin-motor and pusher types of planes. Not only does one suffer from temporary deafness, which may become permanent, but also infections of the external auditory canal and accumulation of wax, which cause a great deal of annoyance, are frequently found. The

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

wax becomes very hard and forms an obstruction to air currents. The Eustachian tube becomes involved, producing a train of unpleasant symptoms, such as tinnitus or ringing in the ears, dizziness, giddiness, pain, and diminished hearing. In the pusher type of planes, even though the ear is properly protected, a marked but temporary deafness is experienced. The writer on frequent occasions after riding in an HS2 type of plane (pusher type), even after short flights, experienced marked disturbance in hearing. After long flights the deafness lasts from 24 to 36 hours and sometimes longer. All sorts of devices and chemical substances have been recommended, and after practically trying out all of them in this squadron we found only two things of value, namely, ordinary absorbent cotton, which is being used by the majority of fliers, and a second preparation made up in the form of a suppository, consisting of beeswax, lamb's wool, and parasine. This suppository has been found very useful. If it is held in the hand for a few moments before inserting it into the ear, it softens and it then can be shaped to fit the external auditory canal. The consistency of this suppository varies with different seasons of the year. In winter we use one part of beeswax and five parts of parasine and a few strands of lamb's wool, and in summer two parts of beeswax and four parts of parasine and lamb's wool. This combination seems to be the best one we have at present.

No one should fly without protection of some sort for his ears. The constant humming of the motor not only affects the transmission apparatus, but actually produces pathological changes in the internal ear and perception apparatus. If the cells in the internal ear, having become detached from their basic membrane, are not given an opportunity to regenerate, permanent injury is going to take place, resulting in marked diminution of hearing.

Safety helmets.—Safety helmets are of great value, especially in aviation training schools. At the naval air station, Pensacola, two types of safety helmets are being used, one for instruction purposes and one for the student to wear for solo. Both helmets are made of thick heavy leather. The helmet used for instruction purposes is known as "Gosport" helmet and differs from the other or crash helmet only in the attachment of a voice tube and two receivers for the ears. The instructor can, by means of this attachment, communicate with the student and give him necessary orders. The student signals by means of his hands whether or not he understands the instructions. The student can not talk to the instructor, which is very often quite fortunate for both of them. Both helmets are so constructed that they can be made smaller or larger, but at best they are extremely uncomfortable by exerting a great deal of pressure upon certain head surfaces. After an hour's flight, they produce headache and make one feel extremely miserable. These helmets

Digitized by Google Original from UNIVERSITY OF MICHIGAN

were being tried out at the time the writer took instruction at Pensacola. It is believed that they are of great value, provided improvement is made in them with the view of relieving the pressure upon the head and making them in general more comfortable for wear. In a crash, they certainly help to prevent scalp wounds, and the side flaps protect the ears from injury. On one occasion, the crash helmet was responsible for the saving of a student's life, when he walked into a propeller. The blow from the propeller split the helmet and caused a slight scalp wound. There was no doubt in any one's mind who saw the accident that the helmet prevented a serious if not fatal injury. The helmets are worn only at training schools. Pilots engaged in other activities do not use them. Instead, a soft, fur-lined helmet is used in winter and a plain soft one in summer, and they are considered quite satisfactory at reasonable altitudes, with the exception that they afford no protection from the sun. Some of the pilots have leather visors stitched to the helmet, extending at an angle over the goggles, and these visors are of particular benefit when flying in tropical countries.

Crash Bars and Safety Belts.—A crash bar is a thin, soft-leather cushion, extending from one side to the other of the fuselage about the middle of the pilot's cockpit. When the pilot is seated in the cockpit, the bar is about parallel with the infraorbital ridge or eyeballs. These crash bars were installed on all training planes. It was found on investigation of numerous crashes that the students most frequently sustained face injuries, either to nose, forehead, tongue and lips, by falling forward onto the cowling on the impact of the machine on the ground or on the water. However, the writer never had any faith or confidence in these crash bars. It has always seemed to him that the force of the impact would be sufficient, should the pilot's head strike the crash bar, to cause a fracture of the cervical vertebræ, which would be a much more serious injury than a cutting injury to the face or the head. One accident did occur on the station in which this exact injury was sustained. I have always believed that this man's fracture of the cervical vertebræ was due to the tremendous force with which his head hit this crash bar. He went into a nose dive from about 3,000 feet and most likely the crash would have proven fatal even though he had not sustained the injury in question. These bars are not being used, as far as I know, anywhere else, but are still being tried out in Pensacola. It will be interesting to watch the results. A better substitute for the prevention of injuries to the head and face, caused by falling against the cowling or instrument board, would, in my opinion, be a properly constructed safety belt to be worn around the chest. The belts in use at present are worn around the waist.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

It is also claimed by many that the waist safety belts are very liable to cause abdominal injury. The writer believes that the ideal belt would be a broad and resilient breast belt, attached to the framework of the fuselage, and so constructed that it can be easily and quickly released. However, be it waist or breast safety belt, all pilots in single-motor planes should wear either one or the other and should put them on and secure them properly before leaving the ground. They should also know and practice how to release these belts quickly. In several accidents the belt was found to have given away. Therefore, strong but resilient cloth should be used in their manufacture. Both waist and breast safety belts are worn by some pilots. Another measure for the prevention of face and head injuries would be a padding around the front cowling of the cockpit. Not very long ago two pilots were in a collision about 2,500 feet in the air and both planes were so badly damaged as to make them uncontrollable. One of the pilots tried to climb out of the fuselage on to a wing and as his plane crashed he was killed. The pilot in the other plane had sufficient presence of mind to take the cushion from under his seat and hold it with his left arm against the front cowling of the cockpit. When he crashed, the only injury sustained was a fracture of the left arm with which he was holding the cushion.

Clothing.—The question of clothing has caused a great deal of argument and also embarrassment. A special uniform for aviation personnel existed up to July 1, 1922, at which time it was abolished by order of the Navy Department. Only the regulation blue service dress is supposed to be worn. This is almost an impossibility. After wearing a blue uniform on one or two long flights, it is ready for the discard. Certainly it can not be worn any more for Saturday morning's inspection or for any other occasion on which one is supposed to appear presentable. Of course, the order is being carried out without any question. The writer is not aware of the reasons for the abolishment of the original uniform, the only one suitable for actual flying. It was a forestry-green uniform, of heavy material, did not soil very readily, had a standing collar which kept the neck warm, and in general was well suited for aviation purposes. Dungarees are thin and do not keep the body warm. It is to be remembered that the temperature of the air becomes 1° Fahrenheit colder for every 365 feet of climb, and at high altitudes very extreme cold has to be endured. Clothes alone have been found at very high altitudes to be insufficient as a protection against the extreme cold, and the warming of clothes by electrical means has been tried. But even at ordinary altitudes in certain seasons of the year extreme cold is encountered and a good, warm, serviceable uniform

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Life preservers must be provided for every man aboard, in handy places and frequently inspected to assure their good condition.

Food rations and water sufficient for two days for the complement of the plane must be provided. The rations in this squadron consist of the following per man:

1 pound baked beans.
1 pound brown bread.
1 quart water.

This food ration is absolutely essential for large planes making long cruises over water. However, smaller land and sea planes must also be fitted with the above-mentioned necessities. That the above articles of food are necessary may be seen by a glance at the illustration, Figure 11, in this article. This picture shows a land plane forced down at sea, but in this instance the pilot fortunately made his landing in proximity to a number of ships.

All aviation personnel going on extensive cruises should wear the standard Navy identification tags. The wearing of these tags is considered by everyone more or less of a nuisance, but in organizations whose activities are almost entirely confined to the sea the wearing of tags is an absolute necessity. The Navy Regulations require that these tags be worn around the neck or around the wrist. However, the neck and the wrist are not considered the best places by many who know from experience, and it was suggested to the writer that the best place is around the waist. However, they should be worn as required by the United States Navy Regulations. If the individual desires to wear one around his waist, an additional tag can always be secured from the Medical Department.

A great deal of difficulty is experienced by medical officers in case of serious or fatal accident in finding any information regarding the family of the individual to be notified in case of serious accident as required by Navy Regulations. It is true that the health record should contain the necessary data, but many officers change their address and fail to change it on their records. The writer has had several such experiences and he recommended to the commander air squadrons, Scouting Fleet, that an emergency slip (given below) be filled out by every officer and enlisted man and same be kept in the safe of the commanding officer. This emergency slip is confidential and is never referred to except in case of serious accident. If the pilot is transferred, he calls for the slip and takes it with him to the next station.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

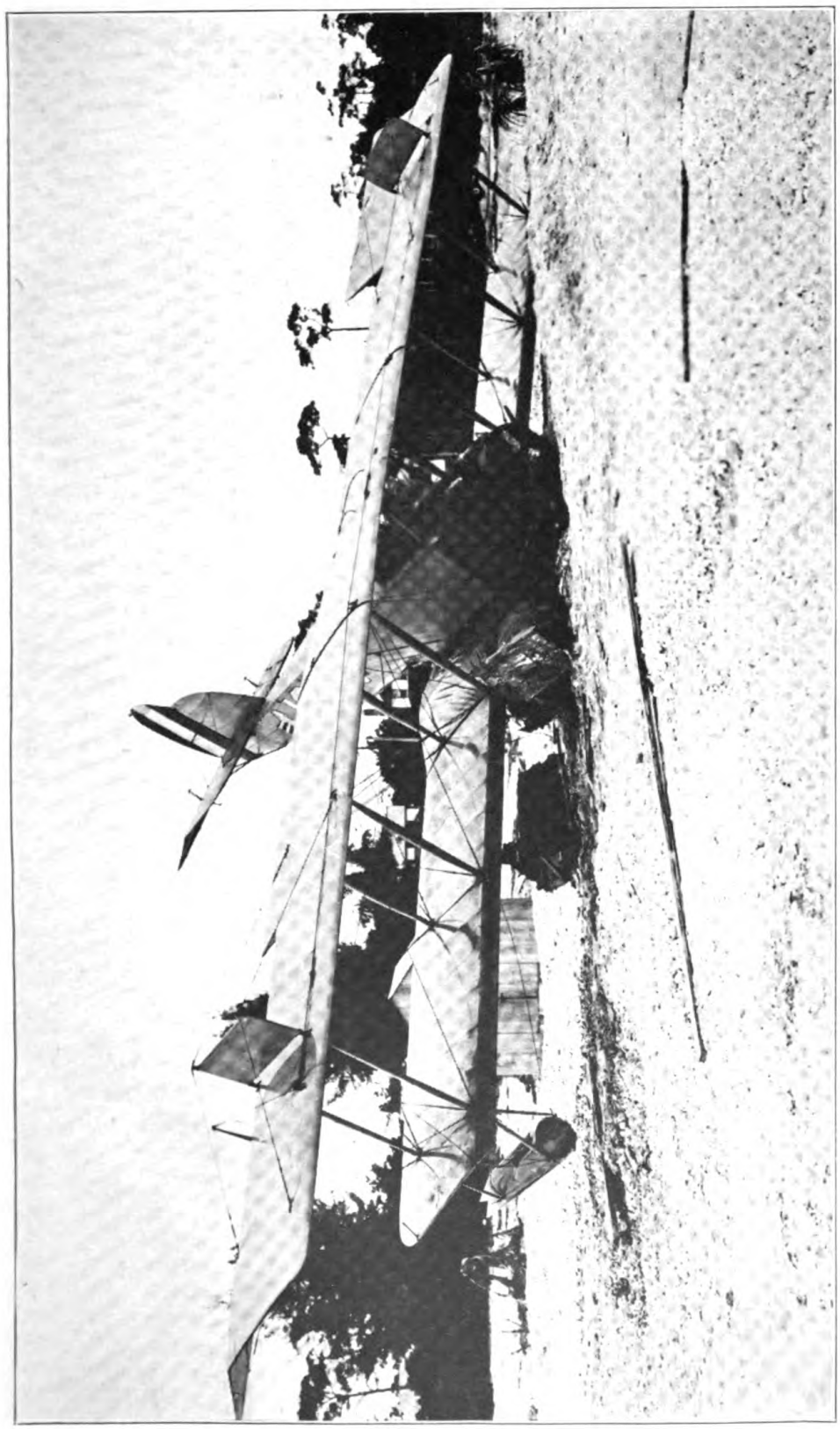


Fig. 14.—CRASH OF SEAPLANE ON LAND, THE RESULT OF TURNING WITH INSUFFICIENT SPEED.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

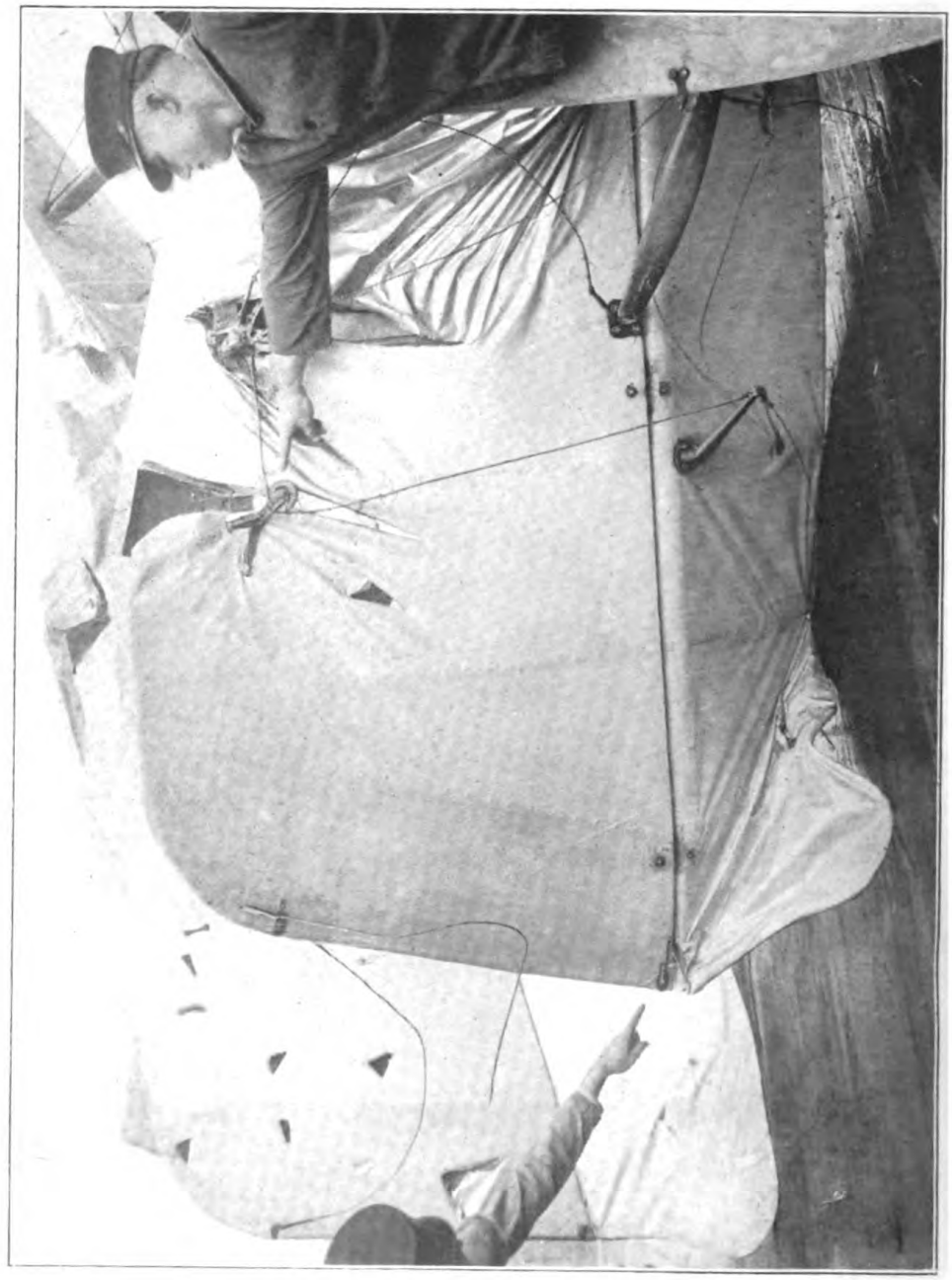


Fig. 15.—CRASH DUE TO A MECHANICAL DEFECT.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

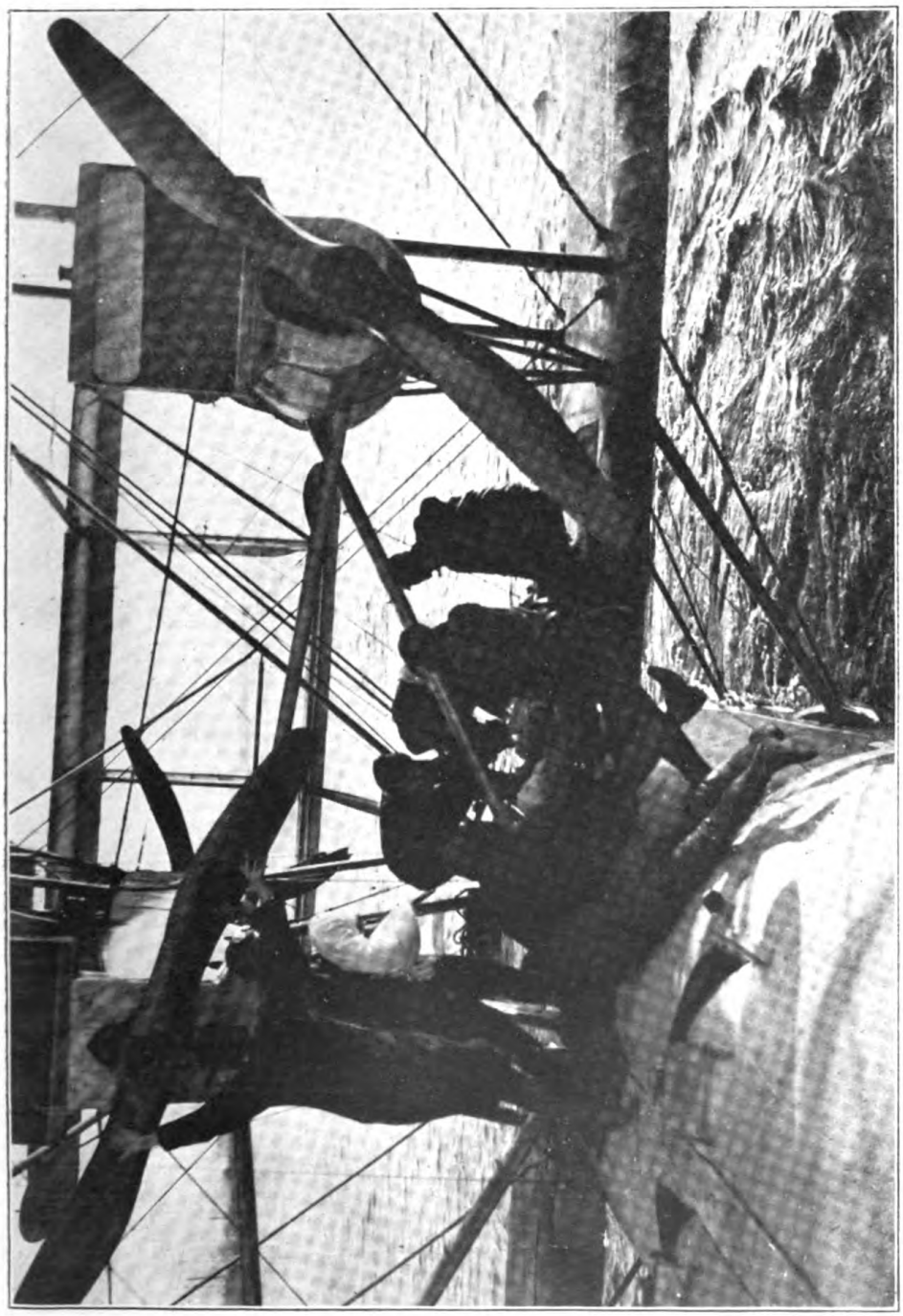


Fig. 16.—PROPELLER ACCIDENT. THE MAN LYING ON THE WING OF THE PLANE WAS HIT BY THE PROPELLER. NOTE THE BROKEN PROPELLER BLADE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



Fig. 17.—TEAR IN THE ENVELOPE OF A DIRIGIBLE NECESSITATING A FORCED LANDING IN WATER.

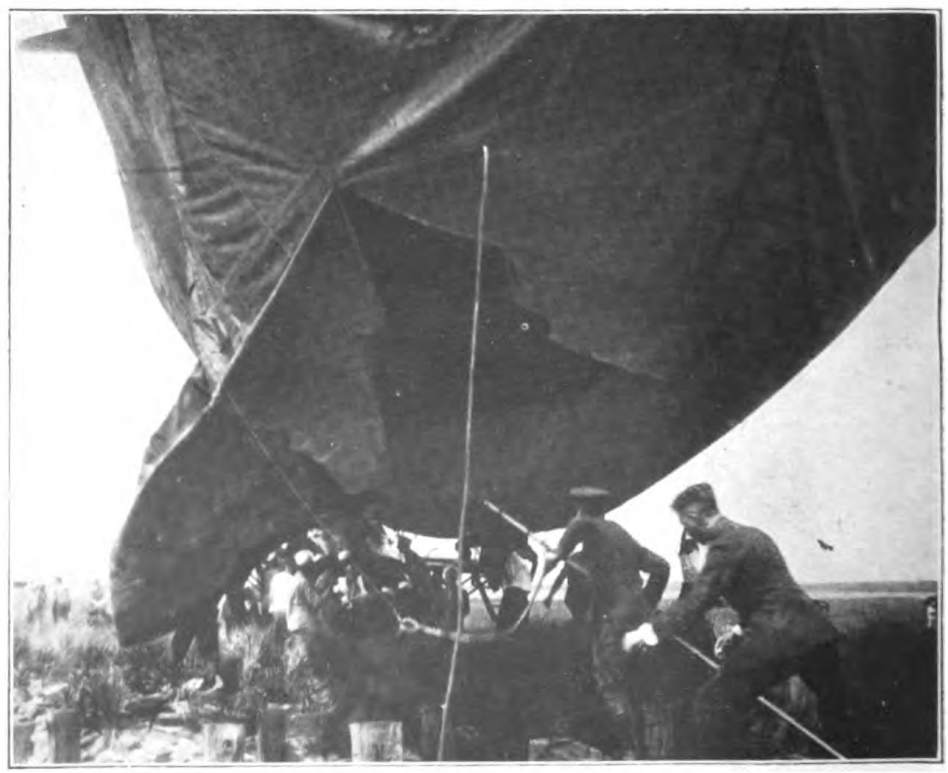


Fig. 18.—FORCED LANDING OF DIRIGIBLE ON LAND, DUE TO SPONTANEOUS TEAR IN ENVELOPE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

U. S. S. "WRIGHT."

From:
To:
Subject: Statement regarding wishes in case of serious or fatal accident.

1. Notify by telegram.

	Name.	Relationship.	Address.
1.			
2.			
3.			

2. I request that _____ inventory my effects.
3. I request that all my personal effects and papers be delivered to:

Name.	Address.
Name.	Address.

4. My life is insured in the following companies:

Name.	Location of policy.

5. I have accounts at the following banks:

Name.	Location of bank and check book.

6. I have safe deposit boxes at (name of location):

7. I have a will at (location):

NOTE.—This certificate is confidential. Any other information you would like to give, please do so in space below.

NOTE.—Seal envelope and mark: From (John Smith) Lieutenant, to Commanding Officer, U. S. S. *Wright*.—Confidential. To be opened in case of serious or fatal accident.

[Call for same in case of transfer.]

High altitudes.—There is another important question in aviation which is a medical problem, namely, the effect of decreased amount of oxygen at high altitudes and of extreme cold upon the human body and the human mind. This is a subject in itself, and the writer hopes, as development of aviation medicine progresses, to gain some additional information and data on the effects of decreased oxygen supply on man, air sickness, altitude sickness, and staleness, and report on same some time in the future.

Investigation of accidents.—It was surprising to note the different opinions regarding causes of accidents given by different observers of the same accident. One would give the causes as error in judgment, and another would call it a skid, a slip, or something else.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The writer has witnessed quite a number of accidents, and on each occasion, if there were 10 officers standing by watching it, there would be 10 different theories and opinions. It is believed that every accident should be thoroughly investigated. The board of investigation should consist of experienced aviation officers, not less than four in number, and one flight surgeon. The importance of this investigation is not whether the crash occurred in the line of duty and how seriously the pilot was injured, but to find out what were the real causes of the accident. The information thus obtained should be utilized for the prevention of a repetition of the same accident. The medical officer should investigate the pilot's past medical record, find out if an accident occurred previously, whether waivers were granted for certain physical defects, what the psychological rating was at the time of the last physical, as well as previous physical, examination. Too many accidents are listed as "unknown." Only by thorough and painstaking investigation can we learn any lessons and prevent the occurrence of the same accident over and over again.

The writer expects that this article will call forth a lot of criticism and many will not agree with everything he has stated. He hopes such is the case. As an answer I wish to quote the words of Lieut. Page O. Northington, Medical Corps, United States Navy, who once wrote:

> It is a matter of ordinary medical observation that whenever man's genius and accomplishment provide a new vocation in a heretofore unaccustomed environment there is inevitably an accompaniment of its own peculiar ills and medical problems. That this country through the Army was first to establish a research laboratory and school for the purpose of investigating those peculiar conditions to aviation and providing measures consistent with the best physical welfare of the aviator is praiseworthy and creditable. We would be credulous, however, in thinking that the present standard of qualification is immutable and that the problems of care and classification have been solved to the ultimate satisfaction and best interest of those concerned, and moreover, it would be erroneous to maintain that in the field of application, other than partially beneficial results have been accomplished from the present accessible knowledge of medical aviation problems. As we know, the history of our service is a noble one; honored traditions and customs have developed and become an important, inseparable part of it. May there be, however, no devotion to precedent that does not bespeak a farsighted policy when there comes a time for innovation, application of new principles, and the enlistment of the cooperation necessary for the best ultimate results in any untried undertaking.

If the above statistics will be of value and the suggestions I have given will be instrumental in saving one human life, I shall feel fully repaid for the difficult and sometime seemingly impossible task of collecting the data. Many times during the writing of this article, my memory brought back to me many unpleasant experiences, recalling the deaths of such men as Chevalier, Roth, Null,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Ericson, Armstrong, Blackwell, Harrington, Brumbaugh, Hill, McFadden, and many others, not mentioning those permanently injured, many of whom were my closest personal friends. We mourn them for making the supreme sacrifice and pray for their everlasting peace. But like real sailors and soldiers, we must carry on, appreciating the bravery of all who do continue, with the hope that our country will adequately reward all who help America's defense in the air.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS.

AVIATION ACCIDENTS.

Doctor Neuberger's article on aviation accidents and the methods of their prevention, appearing in this number of the BULLETIN, will no doubt be of great value to the Medical Corps. The rapid advance of aviation activities in the fleet demands that "aviation medicine" become a part of the general information of every naval medical officer. Although the airplane carriers, aeronautic training stations, and airplane squadrons will require medical officers who have been specially trained as flight surgeons, it will be manifestly impossible to provide such officers for every division of the fleet using airplanes. Ability to detect evidence of nervous exhaustion in an aviator calls for considerable knowledge of aviation medicine and the methods of examination. Doctor Neuberger discusses the Schneider index, which appears to be the most practical test at present for functional activity. The importance of determining the normal standard for each aviator as a guide for continued observation is self-evident. The relation between the nervous system and overfatigue has been long recognized, but it is well to know the symptoms. The safety of the ship may depend on the efficiency of the aviator. We can not afford to ignore the demands made on his nervous system and must be prepared to recommend action by the commanding officer to prevent disaster. The pilot himself is usually the last to recognize his condition. Preventive measures that have been found of value in maintaining the best physical condition of the aviator should be known and instigated by the medical officer. Today the most important factor in aeronautics is the human element. Doctor Neuberger's statistics are conservative, for it has been stated by well-informed authorities that 70 per cent of accidents are due to staleness or physical conditions that could be avoided. Previous figures for the United States Navy for accidents since 1919 stated that 96 per cent were due to pilots and 4 per cent to machines. The United States Army Division of Military Aeronautics published in 1919 a very complete report of The Air Service Medical, and in the Journal of the Military Surgeon for September, 1923, there is an excellent article on the development of aviation by Lieut. Col. W. R. Davis, of the Army Medical Corps. In the same number of this

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

magazine there is an interesting description of the training of flight surgeons at Mineola by Lieut. J. D. Benjamin, Medical Corps, United States Navy, now attached to the U. S. S. *Langley*. The previous articles by Lieutenant Neuberger that have appeared in the BULLETIN cover the subject of aviation medicine in a most comprehensive manner. Every medical officer should feel indebted to him for this valuable information. Doubtless many have believed that only those who are trained as "flight surgeons" will be required to know aviation medicine, and therefore have not considered it necessary to make a special study of the subject. With a limited number of planes on any unit of the fleet, it is even more imperative that the few aviators attached be carefully observed.

AIRPLANE ACCIDENTS FROM THE BRITISH VIEWPOINT.

At the annual meeting of the British Medical Association in 1923, among many interesting papers presented to the section of naval and military hygiene, one on airplane accidents by Dr. H. Graeme Anderson, surgical consultant, Royal Air Force Medical Service, is of interest in connection with Doctor Neuberger's paper which appears elsewhere in this issue of the BULLETIN. The following extract of Doctor Anderson's paper is from the British Medical Journal of November 17, 1923:

"The points to be considered in classifying airplane accidents are, first, the causes; secondly, the type or in which part of the flight the cause was initiated; and, lastly, the actual damaging factor.

CAUSES OF AIRPLANE ACCIDENTS.

"These may be considered under the following headings:

"(1) Defect in the airplane.

"(2) Error of judgment in flying.

"(3) Loss of head.

"(4) Brain fatigue.

"(5) Fear.

"(6) Physical illness.

"(7) Unavoidable causes.

"(1) This cause amounts to mechanical failure of some part of the airplane, and can be subdivided into (*a*) breakage in the air, and (*b*) engine failure. If the engine fails in the air a forced landing is compulsory, but given a fair height—2,000 feet or more—the pilot can usually select a good landing place. One of the commonest examples of airplane accidents is engine trouble just after leaving the ground, and in trying to turn back the pilot loses flying speed and the airplane falls to the ground.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"(2) Error of judgment in flying is the commonest cause of airplane accidents, and of the many examples of this, perhaps the commonest is when on landing the pupil misjudges his distance from the ground and strikes the ground at a varying angle, usually overturning and wrecking the machine. It is difficult to estimate and account for these errors of judgment. In some cases the error may be due to insufficient instruction, and in other cases it may be found on examination that the pupil's standard of vision is below normal; but, on the other hand, the pupil may be physically fit, have normal vision and good balancing power, and in the latter cases it may be a case of delayed reaction times.

"(3) Loss of head occurs fairly frequently and accounts for a considerable number of accidents. The pupil in his new occupation of flying is at high tension, and under the sudden strain of an emergency his power to reason and act synchronously may momentarily lapse, and there is seldom time to correct the error made.

"(4) In contradistinction to loss of head, the pupil in brain fatigue reaches the stage where he has neither the power to reason, decide, or act; a state of mental inertia supervenes. This is due to repeated stimuli received by his brain in rapid succession in his flight—he feels alone and that he can not manage to control the airplane; he feels helpless, and in a stupor awaits events and takes little part in the airplane's control. As a rule, if it occurs, the pupil, even if he should escape injury, soon gives up flying; he is not of a temperament suitable for flying.

"(5) Fear, at least in a degree sufficient to disturb flying, is rarely experienced in the air on the first few solo flights, the mind being far too much occupied and concentrated on details of flying and watching the various instruments.

"(6) At an air station medical inspection of the pilots and pupils at regular intervals reveals any organic disease that might lead to loss of consciousness in the air. Flying on an empty stomach may cause faintness, and as in schools flying commences at dawn, all pupils are first provided with a good meal, while on long flights pilots are provided with tabloid forms of nourishment.

"(7) From time to time unavoidable causes of accidents arise. The terrain in certain areas may be unsuitable and conceal obstacles, while in some airplanes the view of the ground in certain positions may be limited.

"TYPE OF ACCIDENTS.

"The term 'type of accidents' has been suggested to describe the part of the flight in which the cause of the accident was initiated. A flight may be divided arbitrarily into three parts: First, the getting off the ground into the air; second, in the air, with the various

Digitized by Google Original from UNIVERSITY OF MICHIGAN

turns, figures of 8, spirals, etc.; and third, the landing. The commonest type of accident is on landing.

"ACTUAL DAMAGING FORCES IN AIRPLANE ACCIDENTS.

"The injuries sustained are akin to most high-velocity accidents, but are usually more severe, as greater speed is used in aviation. They include the following: (1) Injuries due to crushing, where some part of the pilot's body gets crushed between parts of the wrecked airplane or between the engine and the earth. (2) Injuries due to collision with the ground, as when the pilot is thrown out or hits the ground with his head in turning over in and with the airplane. (3) Injuries due to impact with different parts of the airplane, as when the head is violently jerked forward and strikes the edge of the nacelle on the airplane's impact with the ground. (4) Injuries from fire. (5) Drowning and immersion effects in seaplane work. (6) Suspension effects, as when the pilot is suspended head downward in an overturned airplane and is unable to loosen his safety belt; in many crashes the sudden impact of the pilot's body on the safety belt causes abdominal injuries. (7) Poisoning from petrol fumes.

" SAFETY BELTS, HELMETS, AND GOGGLES.

"With regard to the use of safety belts, endless discussion has taken place among aviators. My own opinion is that before leaving the ground all aviators should see that their safety belts are fastened and should be familiar with the method of their quick release. The belts should never be undone in the air, but a difficult question arises whether to release the belt near the end of a glide before landing. Safety helmets are of undoubted value in school work and should be worn by all pupils. In a crash they certainly prevent scalp wounds and the side flaps protect the ears from injury. Most aviators wear goggles, but there are still some who prefer to fly without them. I personally think that goggles should always be worn; there is no doubt that flying without goggles is apt to set up a spasm in the eyes.

" FIRST AID AT AN AIR STATION.

"The sick bay or dressing station should be in full view of the airplane, with a lookout man supplied with field glasses always on duty during flying hours. Immediately a crash or forced landing occurs the lookout man telephones to the sick bay, notifying the steward of the exact site of the occurrence, and proceeds with a stretcher to the accident. With the stretcher is taken an emergency tool case, which includes crowbars, wire cutters, saw, fire extinguishers, etc. The steward dispatches the ambulance with which

Digitized by Google Original from UNIVERSITY OF MICHIGAN

two sick-berth attendants go, and with them is a bag containing morphine, hypodermic syringes, chloroform, brandy, first-aid and picric acid dressings, etc. If the injured person is conscious and in much pain morphine should be injected and the patient conveyed quickly to the dressing station, where his injuries should be examined and treated; chloroform may have to be given, as it acts more quickly than morphine.

"THE NATURE OF THE INJURIES RECEIVED.

"Surgical work in connection with aviation in general differs but little from that in military and civil life. The difference is mainly one of degree, in that one is mostly called upon to deal with the results of high-velocity accidents associated with falls at varying angles and from various heights. Burns are among the most severe forms of injury. The cold at high altitude is extreme, and aided by the rapid transit through the air is apt to cause frostbite easily. In a large proportion of airplane accidents the occupants receive injuries to the face, owing to the impact throwing their heads forward. Fractures of both bones of the leg and fractures involving the ankle joint are very common."

THE ESTIMATION OF PHYSICAL EFFICIENCY.

The estimation of physical efficiency is an ever present problem in aviation medicine. A paper recently read before the section of Naval and Military Hygiene of the British Medical Association by Group Captain Martin Flack, Royal Air Force Medical Service, contains, according to the British Medical Journal of November 17, 1923, the following remarks on the chief points to which attention must be paid in the assessment of physical efficiency and bodily endurance, namely, (1) respiratory efficiency, (2) circulatory efficiency, and (3) general nervous stability, as regards control through the centers of respiration and circulation and cerebral and psychical control.

"*Respiratory efficiency.*—The practice of measuring the upper chest expansion on inspiration should be abolished or at least combined with a measurement at the level of the floating ribs, which is more important. Correct inspiration consists in the contraction of the diaphragm attended with an upward movement of the lower ribs, and is the type prevalent in individuals who possess the greatest bodily endurance. If inspiration be properly performed correct expiration naturally follows, but it should be borne in mind that expiration is under muscular control, and it has been shown that it is on the expiratory rather than the inspiratory side that individuals

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tend to fail as the results of strain. With regard to the value of spirometry in the assessment of physical fitness there is no doubt that the usual instrument gives very inconstant results, and there is, moreover, still a divergence of opinion as to what constitutes the normal vital capacity. It is, however, a distinct advantage to be able approximately to estimate the vital capacity, and for this purpose the author compares Dreyer's tables with one prepared from the results of Cripps, Greenwood, and Newbold. In this way an idea is obtained as to what vital capacity should be for the standing height, sitting height, weight, and chest circumference of the individual in regard to Dreyer's figures. The vital capacity should equal his class A, or, preferably, exceed this class by 300–500 cubic centimeters. When the vital capacity falls much below this, respiratory insufficiency is certainly present. Observation proved that officers who could not fly high possessed a small vital capacity, and especially those who were suffering from flying strain. In the latter the diminution in vital capacity was shown to be to an inability to expire sufficiently to empty the lungs to the full extent. The fit individual is possessed of a good vital capacity mainly because he has this power of adequately emptying his lungs by expiration. In the individual who is respiratory inefficient the vital capacity is considerably reduced by prolonged physical effort and his 'ventilation capacity' is decreased (residual air increased, and the ratio of vital capacity to residual air diminished). Thus the respiratorily fit person is one who, in response to physical effort, is able to maintain his 'ventilation capacity' at a relatively high level over the whole period of performance. Diminution in ventilation capacity further involves a relative increase of carbon dioxide and decrease of oxygen in the alveolar air.

"The partial pressure of carbon dioxide and oxygen plays a considerable part in determining the time over which an individual can hold his breath. In the fit subject it requires a considerably greater diminution of the partial pressure of oxygen to induce symptoms of respiratory instability and circulatory embarrassment (violent desire to breathe, quickened heart rate, increased blood pressure, congestion of the face) than in one who is suffering from fatigue or lowered efficiency. Similarly with an increased percentage of carbon dioxide, both the 40 millimeter Hg test and the breath-holding test may, therefore, be taken as affording indications of the ventilation capacity of the individual and of his susceptibility to changes in the alveolar partial pressures. Stable control by the respiratory center is an important factor in bodily endurance, and the above tests are of value in assessing respiratory efficiency in this respect. In an individual of adequate respiratory capacity the time

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of holding the breath without undue discomfort is, in the breath-holding test, 69 seconds; in the 40 millimeter Hg test, 50 to 55 seconds. The expiratory force test is of value as showing the condition of the expiratory musculature; generally respiratory insufficiency is indicated when the reading falls below 110 millimeter Hg, and it is certainly significant of general physical inefficiency when it fails to reach 80 millimeter Hg.

"*Circulatory efficiency.*—A pulse rate, at rest, above 84 (not due to temporary excitement) is characteristic either of nervous instability or of physical insufficiency. As regards the latter, it was found, for instance, that by special exercises for one month the average standing pulse rate of number of 'weedy' recruits was reduced from 95 before training to 79 after training. A quick pulse rate (96 or above) is frequently an expression of nervous instability, particularly a quick pulse associated with a respiratory rhythm. Such persons are not, generally speaking, suitable for arduous-service duties, and frequently break down.

"The arterial pressures afford important information. If in the absence of any clinical signs of disease in a person of 20 to 25 years of age, the systolic and diastolic pressures are persistently high and the pulse pressure exceeds 50 millimeter Hg (for example, SP 160, DP 104, PP 56), the individual may be regarded as having a 'nervous temperament' and as not likely to stand great physical and mental strain. In certain cases such pressures are due to excessive indulgence in alcohol over a prolonged period, and the other tests for physical efficiency, particularly those for nervous stability, will then be found to give unsatisfactory results. As regards low diastolic pressures, one below 70 millimeter Hg combined with a pulse pressure of more than 50 millimeter Hg is indicative of lack of physical stamina for flying duties. Such subjects are particularly liable to faint in the air and the same holds true to a less extent as regards physical endurance on the ground. The fit individual is one in whom the margin of fall of the diastolic pressure is in the neighborhood of 30 millimeter Hg (that is, a diastolic pressure of 80 millimeter Hg) before the fainting pressures is reached. In subjects with a low diastolic pressure a contributory factor of great importance, and one that is insufficiently appreciated, is the accumulation of blood in the abdominal veins in the upright posture. In this condition the systolic output is reduced and becomes insufficient to maintain an adequate diastolic pressure, although the arterial systolic pressure remains normal. As affording information of this condition the pulse response during the 40 millimeter Hg test is of great service. In a fit subject there is little alteration of the initial pulse rate over a period of 50 to 60 seconds, and the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

arterial pressures are not greatly raised (30 to 40 millimeter Hg to 160 to 170 millimeter Hg). In the less fit, on the other hand, the test produces a greater and more rapid elevation of the arterial pressures (for example, to 180–200 millimeter Hg), while the pulse rate rapidly increases to 120–130 or more. This increase is maintained when the total rise of pressure is not abnormally high, but is succeeded by a marked and often abrupt fall of pulse rate when the arterial pressure is increased to a high point—for example, 220–240 millimeter Hg, a point which appears to be constant for each individual. The fall is possibly due to reflex slowing of the heart rate owing to stimulation of the depressor nerve endings in the aortic arch through raising of the blood pressure due to the increased flow of blood to the right side, caused by the abdominal effort necessary to sustain the column of mercury.

"Certain subjects display a combination of these results as regards arterial-pressure readings—namely, a high systolic and a low diastolic pressure; for example, SP 150, DP 60, PP 90. Such individuals are 'highly strung' as regards nervous stability and markedly inefficient as regards physical stamina. From the point of view of air work, such subjects present an interesting response to rotatory movement; when they are rotated 10 times in 20 seconds the pulse is greatly increased in rate, the SP pressure rises but the DP falls, and fainting may ensue. In certain individuals who are relatively physically efficient the rotation induces a marked rise of both systolic and diastolic pressures, and such individuals are probably liable to suffer from nausea and vomiting in the air.

"The abdominal wall plays an important part in counteracting the influence of gravity in producing abdominal venous congestion in the upright posture, and it is impossible to overestimate the importance of a good-toned, mobile abdominal wall in maintaining efficient circulation and respiration and thereby preserving physical efficiency.

"When the abdominal wall is lax and ineffective the supply of blood to the heart during exercise will be insufficient, owing to the large abdominal pooling of blood, and the heart will therefore, to meet the demands of the body, be obliged to pump a relatively small supply of blood at a quicker rate. Such increased heart rate is frequently regarded as a sign of myocardial insufficiency, whereas in many such cases it is due to an efficient heart making the best use of a poor supply of blood. Such a condition is often found in persons who have returned from the Tropics.

"The ill effects of gravity are further counteracted by the tonic contraction of the splanchnic arterioles. Information as to the tone of these vessels is afforded by the pulse when the subject rises from

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the sitting to the standing posture. Generally speaking, it may be taken as true that the greater the increase in pulse rate, and the more prolonged the quickened rate, the greater the insufficiency.

"Circulatory efficiency may be assessed as follows: (1) A normal steady heart beating about 72 a minute, not unduly increased in rate by exercise and returning quickly to normal steady rate. (2) A pulse pressure of 40–50 millimeters Hg associated with a well-sustained diastolic pressure (about 80 mm. Hg). (3) Absence of abdominal pooling in the venous reservoir due to the effects of gravity on the circulation owing to poor tone of the abdominal belt of musculature.

"*Stability of general nervous control.*—The importance of stability of the circulatory and respiratory centers in the maintenance of physical efficiency has been indicated above. General nervous stability plays a great part as regards bodily endurance. The tests employed in the Royal Air Force are considered to be sufficient to reveal the condition of physiological or psychical control. Thus tremor is evidence of some disordered functional state. Tremors of the eyelids alone are usually indicative rather of a highly strung disposition or the result of legitimate stress, such as overwork or strain of occupation; tremors of fingers and hands rather of illegitimate stress, such as excessive indulgence in tobacco or alcohol; while tremor of both eyes and fingers generally signifies nervous instability due to a combination of the above causes. As regards the knee jerk, a so-called brisk or exaggerated response is not in itself necessarily an indication of nervous instability, but a condition not infrequently called 'exaggerated knee jerk,' attended by a convulsive movement of the whole body, indicates loss of general control and has nothing to do with tendon reflexes. This 'exaggerated knee jerk' is usually associated with a state of anxiety, conscious or subconscious. The tests of standing on one foot with the eyes closed and of balancing a rod on a flat board elucidate the condition of central control rather than the condition of 'muscle sense' or 'vestibular stability"; failure in them, therefore, indicates some want of afferent or efferent control.

"In many instances it is the failure of the control through the medullary centers which predisposes to breakdown of the higher centers."

THE AIR AMBULANCE IN WAR.

According to the British Medical Journal of October 20, 1923, Air Commodore D. Munro, in his presidential address to the war section of the Royal Society of Medicine on October 8 last, discussed

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the possible uses of the airplane in the medical services in future warfare.

"The history of the air ambulance, he said, began necessarily with improvisations, by which he meant the temporary use of an ordinary service airplane to carry sick and wounded, either with no special arrangements at all or only primitive ones, or with a special kind of stretcher adapted to the machine, or a special adaptation of the machine to take the ordinary stretcher. During the retreat of the Serbian Army in 1915 the French made some arrangements for air convoy of wounded. At the end of 1920 the French in the Levant organized an air ambulance in which 80 cases were carried to hospital during a period of four months. For this purpose the machine guns were removed from airplanes and the patients strapped in their place. In May, 1923, during an epidemic of dysentery among the British forces in Kurdistan, 198 cases were conveyed by air to Bagdad. The distance was 100 miles as the machine flies, and was much longer by mountain track, which would have had to be taken had the airplanes not been available. The operation was difficult owing to bad weather and the lack of suitable landing places, but it was carried out quite successfully in 98 flights; the time occupied in the evacuation was 128 hours 45 minutes. Unfortunately the only airplane specially designed for this work had to make a forced landing and was put out of action, so that the task was completed by improvised machines. The special kind of stretcher used with the service airplane was of a naval pattern, adapted to airplane purposes by the use of an extra lining. It consisted of bamboo sticks in canvas, with a head cushion, a blanket cloak, and a head and face mask. The squadrons in Egypt and Iraq were now supplied with these stretchers for use in emergencies. They were strapped onto the fuselage, and the machine-gun fitting was used for fixing in position. If necessary, two patients could be carried in the one machine.

"The adaptation of the airplane itself to accommodate the ordinary stretcher was carried out during the Somaliland expedition of 1919–20, when a machine, known among the troops as the 'blood-wagon,' was altered so as to take one stretcher and an attendant. The French in Syria and in Morocco had a regular service of such adapted machines, and it was reported to the French Colonial Congress of Public Health in 1922 that in the former country 105 casualties and in the latter country 168 had up to then been conveyed in this manner without mishap. In 1921 the French Minister of War put into commission a type of machine which carried two stretcher cases, a doctor, and a nurse, and had a roomy cabin where emergency operations could be performed, for which apparatus and equipment were installed. In the British designs there was no pro-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

vision for the performance of operations, but chief attention was paid to suitable seating accommodation. In the Vickers-Vernon airplane two stretchers were run in on rails through the nose of the machine, and there was provision for seating eight patients on deck chairs arranged along the inner wall of the fuselage. There was provision also for an ice and food box, sanitary conveniences, and an electric kettle and sterilizer. The machine was well ventilated, smooth-running, and the engine note not disagreeable. There were three of these machines at present established, and the number was being increased; another type was in building, to take two stretchers, and to be specially suitable for going out to the scene of a crash in such a country as Mesopotamia. In future these air ambulances would have their own medical personnel, and mechanics and pilots would be told off for them. In warfare it would be possible to form aerial convoys for use between the front and the base hospital, and the method would suggest itself particularly for the bringing in quickly of abdominal and head casualties."

GAS WARFARE IN THE AIR.

The possibilities of gas warfare in the air is pointed out by Mr. Ernest Jones in the following article which appeared in International Aeronautics of September, 1923:

"The carrying chemical warfare into the air is a perfectly logical development. A greater amount of gas can be carried a greater distance into enemy territory by aircraft than by gunfire; and gas can be laid down with greater effect, under certain circumstances, than that of shells.

"Gas is especially suitable for distribution by airplane. Weight for weight it is even more effective against personnel than high explosives. In distribution over an area, the vapors are carried by the wind and direct hits are not necessary. Against gas, buildings, dugouts, hollows, and other natural conditions offer no protection. It may be used against trenches, dugouts, headquarters, roads, artillery positions, supply depots, fortifications, strong points, naval craft, coast fortifications, shops, munition plants, and others, with a wide range of possibilities.

"*Tactical uses by air services.*—In an air attack, a nonpersistent gas, such as phosgene, could be put down in a heavy, lethal concentration in one locality where troops were massed and secure many casualties before gas masks could be adjusted. The gas from bombs even penetrates masks in the vicinity of bursts.

"Such a gas would be utilized where friendly troops are expected to make use of a place immediately after the attack, as the entire enemy works might fall into opposing hands ready for operation.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"With the persistent type of gas there would be a field for large bombs against lines of communication and approaching railheads, large terminals, concentration camps, depots, ammunition dumps, and important crossroads. Gases of the mustard type would make such spots untenable and prevent all use of the locality. Any penetration of this area by troops or transportation equipment would mean casualties, even if the gas only penetrated the uniform. While efforts are being made to treat fabrics so that gas will not penetrate, the protection afforded will last but a comparatively short time before another treatment is again necessary.

"The effect of such a gas attack would be comparable to that of an equal weight of high explosives. In a troop center the effect would be even greater than that produced by high explosive shells. In the case of the gas, the effect of the gas would continue for another week, or even two, while the high explosive's effect is completed after the first one or two seconds.

"High explosive destroys. Gas will put a railhead out of commission by the effect on personnel but it does not destroy. High explosive would blow up a crossroad, kill personnel, but the hole would be filled up and transportation and movement would be resumed. Gas produces no destruction of the surface but does cause many casualties. The mustard-type gases stay and effect those who follow. The only defense is evacuation.

"Airplanes will use heavy smoke concentrations to protect against antiaircraft gun fire and permit descent to a low altitude where bombing is extremely accurate and in attacks on observation balloons. Smoke screens the plane against antiaircraft attack. It can be made toxic and accomplish the first purpose as well as secure casualties among the enemy.

"Aviators of the future will undoubtedly be equipped with masks and such are now being experimented with. A pilot jumped by an enemy flight would launch his toxic smoke screen and force pursuers to don masks. The mask might also be needed upon landing.

"In adjustment of antiaircraft fire, the airplane can use small smoke bombs to simulate antiaircraft bursts and puzzle the enemy. This was done, in a way, by the French when German long range artillery was bombarding French railroad guns and correcting fire by aerial observation. Here the French produced simulated bursts short or over the gun and the air observer, even though he knew the expected time of the bursts, become confused. Such deception can easily be carried into the air.

"Airplanes are invaluable in the launching of incendiary bombs to create fires as a weapon against lines of communication, railheads, concentration camps, storehouses, barracks, vessels, etc.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"There might be an occasion, in spotting long range naval gun fire, to make visible, by a smoke cloud, the location of an airplane at a distance where it would not of itself be seen.

"Another development is the putting down of a smoke screen on the water to hide the fleet, using the airplane in this instance as a possible substitute for the destroyer.

"An army screen would cover the movement of troops or artillery along a road.

"A large area might require gassing from the air, a fortified town in which the defenders are all below ground and the location is beyond the reach of artillery.

"The use of a slow-burning type of bomb, with tear gas filling, would offer an excellent weapon to cause evacuation of an area by mobs, native troops, etc., without causing casualties. For training purposes, they may be simulated an area made untenable by a chemical warfare agent.

"The airplane furnishes the means for heavy concentrations of all types of gas at points which can not be reached in any other way. Munitions plants, dumps, barracks, depots, railheads and all centers of activity far in the rear can be reached.

"With the increasing size, or weight-carrying ability of airplanes there will be further development of tactical uses; 4,000-pound bombs are already being produced; it will be possible to develop and use 5,000-pound bombs, or even larger.

"*Areas which may be covered.*—It has been figured that a square 10 miles on each side containing 100 square miles, would take 3,000 tons or 30 tons to the square mile, to render the area uninhabitable almost immediately after the laying down of mustard type gas. A thousand tons of mustard gas more or less evenly distributed would make the same area seriously uncomfortable, with numerous casualties and ultimate evacuation. This amount would start taking effect in 30–45 minutes after release.

"If this amount were distributed by bombs, the gross weight to be carried by airplanes would be doubled as the weight of the containers themselves would probably be about equal to the weight of the gas.

"However, if the mustard gas were sprayed the intensive effect could be gotten with about 1,500 tons or the harassing result with 500 tons, not counting the weight of containers and spraying apparatus. Spraying certainly appears the more efficient means of distribution if practicable under given circumstances.

"In using phosgene, a heavy concentration would result in casualties almost instantly but it would not be used simply to harass personnel as it will remain but about 30 minutes after being re-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

leased. To obtain an intensive lethal concentration of phosgene for an area of 100 square miles, 3,000 tons would be required.

"Using a tear gas, the same area of 100 square miles could be covered with but 62 tons of gas. This amount would make life very disagreeable, would require the continuous wearing of masks and the effect would last 3 to 7 days.

"This area, of course, may be considered as a stretch of front 100 miles long and a mile deep or a strip 2 miles wide by 50 miles long.

"For various results, various methods and materials in different amounts will be utilized.

"There are toxic and nontoxic smokes, persistent and nonpersistent gases, toxic solids, and incendiary solids and liquids.

"*Forms of chemical warfare agents.*—Gas for use may be either in solid or liquid forms. When released to the atmosphere the solid or liquid becomes a gas or a cloud of solid particles such as smoke.

"An advantage of certain solid chemicals is that the effects are not destroyed by detonation of an explosive. Combined with high explosive a demolition effect can be produced in addition to that of the gas alone.

"The pressures required to maintain many of the types of gases liquid at ordinary temperatures are very high. While the pressure aids in distribution it adds difficulties in manufacture, storage, and handling.

"Carbon monoxide, for instance, would be a perfect, highly effective gas for most uses, as it is odorless, colorless, tasteless, and highly toxic, but the enormous pressure and extremely low temperature required to liquefy it makes it impracticable at present.

"*Kinds of chemical warfare agents.*—Mustard-gas types are extremely effective in causing casualties and their use results in casualties after some hours, even if masks are worn. Their great persistency makes protection very difficult, and the toxic effects may last from one to two weeks, or even longer. They can not be used where friendly troops are expected to shortly occupy the gassed position except in small areas or with possible change in wind direction. This type of gas can be put down by bombs or by sprinkling.

"Phosgene and other nonpersistent gases are lethal but less deadly, weight for weight, than those of the mustard type and, unlike mustard gas, they do not produce casualties by effect upon the skin but must be breathed in relatively heavy concentrations. But these gases are rapidly vaporized and high concentrations may be secured so that the resulting cloud is far more lethal. They are used for surprise attacks where almost instantaneous results are desired.

"*Toxic, nontoxic, and other nonsmoke type agents put down by bombs.*—Lachrymatory gases are usually not lethal in any field con-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

centrations, but they have an almost instantaneous effect upon the eyes and force the wearing of masks. Only a very small quantity is necessary to be effective. Some of them are very persistent. They may be put down by bombs or by sprinkling.

"Incendiary agents include thermit, solid oil, and phosphorus. It may be recalled that phosphorus bombs were used in the *Alabama* experiment. While not as effective an incendiary as thermit or solid oil, phosphorus has the added advantage of inflicting casualties and at the same time producing a highly efficient smoke screen.

"Smoke-screen agents may also be used, such as oleum, titanium tetrachloride, phosphorus, or the standard slow-burning smoke mixture of the chemical welfare service, which is effective. Smoke mixtures may be carried in a tank on the airplane and injected in the engine exhaust. They may also be used in bombs. One bomb has a small bursting charge which gives an instantaneous smoke cloud upon impact. Another type is one which does not explode but in which the smoke mixture burns and gives off smoke over an appreciable period of time, an example of which is the floating smoke bomb used in the *Alabama* experiments. Smoke bombs are of the scatter type, to be used in quantity, or may be in 25 and 100 sizes. Phosphorus may be used in these bombs both for the smoke-producing effect and for the casualty and incendiary effects.

"*Methods of gassing.*—In general there are two methods of laying down chemical warfare agents from aircraft—bombing and spraying. All but one of these agents can be used in bombs. For spraying, so far as known now, only gases of the mustard type and lachrymators may be used.

"The airplane method of spraying toxic gases is to equip the machine with containers for toxic liquids and install a suitable mechanism to allow the liquid to fall as rain. One man can distribute a great amount. The excess weight carried is probably small in proportion to the total bulk of the liquid and this method allows uniform distribution of the toxic liquid. In spraying, the liquid merely falls to the ground like rain and is a more efficient means than shells.

"In the development of gases for airplane use the following items must be considered:

"The development of a nozzle to obtain the best distribution on the ground.

"Largest tank that can be safely carried by the plane chosen for the work. Baffle plates in the tanks might be required, for instance.

"Prevention of leakage of gas on the plane itself, as even a few drops on the plane might injure those handling the machine.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Possibility of having to land with full tank or empty. In case of a crash, a releasing device might be a necessity.

"The amount of liquid which would reach the ground from various elevations.

"Study toxicity within and surrounding the area gassed to determine safe distance for friendly troops.

"Possibility of bursting bombs at predetermined heights in the air.

"It has been found in tests that the liquid must be driven out from the tank in a direction opposite to that in which the airplane is moving and at a speed within 20 miles of that of the airplane. This tends to cause the speed of the plane to be nullified and the drops to fall as though in still air. This must be done if the airplane is at an appreciable height, say, 1,500 feet. Otherwise the drops do not reach the ground, but remain in the air as vapor.

"Various methods of discharging the gas have been proposed. British pilots now doing sky writing force the liquid into the engine exhaust. Another method would be to use an auxiliary tank of some other gas under pressure.

"Experiments are now being conducted by the Air Service in the discharge of gas materials furnished by Chemical Warfare Service.

"An air service can undoubtedly use chemical bombs filled with at least six chemical-warfare agents—mustard, phosgene, toxic smoke, lachrymatory, incendiary, and screening smoke types.

"With mustard and lachrymatory gases the object is to have very small concentrations of the chemical agent over a more or less extended territory distributed by small bombs with high bursting charge to insure fair distribution or by sprinkling.

"With those of phosgene type the object is to obtain exceedingly high concentration on some small target. The wind would sweep the gas cloud away from the spot and the concentration would lessen as the cloud progressed. Bombs for this type would be large and fitted with least possible bursting charge. All would probably be equipped with percussion fuses, as the desirable burst is one at the surface, except where possible air bursts might be desired under particular conditions, for which purpose a different fuse would be arranged.

"The possibilities of toxic smoke are being considered.

"Effective clouds may be secured from bombs loaded with phosgene and fired on impact with water. The Navy may operate with these in deep water only, while the Army may want these for shallow-water use as well, so that it is probable designs will have to allow for firing on impact with but 25 feet of water.

"Smoke bombs may be of two types. One is a slow-burning smoke bomb designed to function upon water impact only and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

while floating on the water give out smoke for a period of about three minutes. These would be of the scatter type and used in quantities. The other is a phosphorus bomb in 25-pound and 100-pound sizes, probably, or even larger. The objects of this bomb are to injure personnel through the scattering of the burning phosphorus, obscure observation, and obtain incendiary effects. These function on contact with solid matter. In the case of an attack on a ship there is the advantage over the first-mentioned smoke bomb in that the burning phosphorus is carried along with the vessel. This time of burning of the phosphorus bomb might be 5 to 15 minutes.

"Bombs giving an instantaneous smoke screen but without incendiary or casualty effect may also be considered in a study of aerial warfare with chemical agents. These use oleum or titanium tetrachloride as a smoke-producing agent and have a small bursting charge. These are used where it is desired to produce instantaneously a smoke cloud upon the release of the material. This could be used for producing a cloud above a battleship in order to obscure the approach of the plane or to produce a cloud on impact with water.

"The wind bears heavily on the use of gas. Its direction on the ground can be found from the airplane by dropping a smoke bomb, after which the bomb load may be dropped on the windward side of the target.

"Present knowledge would indicate that chemical bombs for aircraft will be produced in the following sizes: 8 ounces, 25, 50, 100, 300, 500, 1,000, 2,000, 3,000, and 4,000 pounds.

"*Cooperation of other arms.*—In the development of aerial warfare with chemical agents the tactical needs are the subject of study by the Army and Navy Air Services. The Ordnance Departments of the Navy and Army cooperate with Chemical Warfare Service of the Army in the design and production of bombs and containers. The Chemical Warfare Service is charged with the development of the chemical agents themselves in their application to aerial warfare."

OPHTHALMOLOGY IN ITS RELATION TO AVIATION.

At a recent meeting of the section of ophthalmology of the British Medical Association the relation of ophthalmology to the military and naval services was discussed. Among the papers presented were the two following, relating to aviation. They are reprinted from the British Medical Journal of October 13, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

I.—SOME EYE PROBLEMS SPECIAL TO THE SERVICES, WITH PARTICULAR REFERENCE TO FLYING.

By David Munro, Air Commodore, R. A. F. M. S.

"With the advent of flying the functions performed by the eyes in coordinative movements have assumed particular importance. To the cricketer whose eye is not 'in' nothing worse than a 'duck' can happen; to the aviator it may mean anything from a bad landing to a fatal 'crash.' A single-seater service airplane approaches the ground to land at a high speed, and to perform the evolutions required in landing the pilot has to alter the course of the machine from the gliding angle at which it is descending to a horizontal position—what is called 'flattening out.' He has to judge the exact moment at which to 'flatten out,' and the judgment is dependent on his estimation of the pace of his machine in relation to its distance from the ground. If he flattens out too high up he will lose flying speed before he reaches the ground, and gravity— the vertical component of the parallelogram of forces which is producing his diagonal glide—will take the upper hand. The machine then will fall vertically in the latter part of its course. If he neglects to flatten out till too late he will fly into the ground at an angle.

"This correct estimation of pace and distance seems to depend on 'eye' exactly as in games the estimation of pace and distance in hitting a ball depends on 'eye.' What does 'eye' in this connection mean? Doubtless in the act of landing an airplane, just as in other complicated coordinative acts, the brain takes note of afferent stimuli other than those which it gets through the eye.

"Tactile sensation from the skin through the pressure of the wind on the face assists the pilot for an estimation of pace, also pressure of body against seat of machine. Muscular sense also is of the highest importance; as in riding, 'hands' make all the difference. The sound of the engine tells its tale to the man who knows, yet in the main it is through the eye that the brain gets information and makes its controlling judgment.

"Briefly we affirm that for a pilot it is necessary that the whole optic tract should be functioning normally. We lay stress on good visual acuity in both eyes, for two emmetropic eyes are more likely to work together than two eyes of unequal refraction; but we lay most stress on the coordinative machinery by means of which accurate binocular vision is automatized. Inequality in function between the two eyes we regard as dangerous. Hence I venture to say that while there may be many good players of ball games who have indifferent visual acuity there are few if any who have any marked degree of inequality in functions between the two eyes.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"The essentials for good binocular vision would seem to be:

"1. Correct coordinative movements of the eyeballs as performed by the extrinsic ocular muscles.

"2. Unison in the associated movements of convergence and accommodation as performed by both extrinsic and intrinsic muscles.

"3. An optic tract which transmits faithfully the two retinal pictures which the brain has to fuse.

"4. A cortex which forms concise pictures of the two retinal images—that is, what is known as good fusion sense.

"A man who is suffering from imperfect coordinated action of his extrinsic ocular muscles is said to be heterophoric—in extreme cases he squints. Many men, probably the majority, have one eye that lags behind the other to a greater or less degree in coordinated movements. It is part of what we mean when we say a man has a 'master eye.' But it is not all—to find the cause of his heterophoria one must go back probably to infancy. One eye begins by being better than the other, and the worse eye gets careless and 'neglects.' No one, I suppose, can explain why one eye is born worse than the other or in what developmental fault the difference consists. It may, I presume, be one or more of several parts of the machinery which are defective.

"Whatever it is, if there is inequality the better eye tends to do the work. Thus to us the word 'heterophoria' connotes more than merely 'latent squint,' an unequal action of extraocular muscles moving the eyeballs. It means some of the above conditions are causing bilateral disharmony.

"Thus in the treatment of heterophoria we aim not only at exercising eye muscles—for example, by use of the amblyoscope—but also at reeducating neglecting eyes and teaching them to observe—for example, by Wells's stereoscopic charts. In our view, a man with one eye, or with one totally neglecting eye, who has learned to judge stereoscopically by other means—namely; experience of distance light, and shadow, parallax, or alternating head movements—is less dangerous than a two-eyed man whose one eye only occasionally strikes work.

"To Wing Commander Clements (ophthalmic specialist to the Royal Air Force) belongs the chief credit of realizing the importance of orthophoria among aviators. Under his supervision, organized treatment is undertaken in the Royal Air Force for flying personnel suffering from heterophoric conditions. Bad landers, suffering from manifest signs of heterophoria, are sent to the school. The results so far encourage us to believe that real improvement is effected. Indeed, we know that real improvement has been effected in a number of cases of heterophoric bad landers, but we have not yet got controlled statistics to show how far this improvement can

Digitized by Google Original from UNIVERSITY OF MICHIGAN

be definitely proved to be due to the methods of eye training pursued, and to those only—or as to how long improvement is maintained.

"The effects of glare are also of great importance in connection with heterophoric conditions. No doubt the importance of these conditions is not confined to air force flying, but in the other services; those engaged in work such as range finding have to be watched similarly. I know that it has been considered in the Navy.

"Recent experience seems to show that for the pilot the most important effect of glare is to cause lack of convergence and accommodation, thereby making visual judgment difficult and causing difficulty in landing. The other effects of glare, such as retinal asthenopia, headache, conjunctivitis, etc., being later and more obvious effects, were not of such immediate importance to the pilot. According to the *Report on glare in Egypt*, by Squadron Leader Rippon, in which 150 cases were dealt with, supported by orthotelemeter examination, and to Flight Lieutenant Livingston's reports on 50 cases in India, the main effects were: (1) Fatigue of the ciliary muscle; (2) lack of convergence and accommodation associated in some cases with spasm of accommodation; and (3) aggravation of any existing imbalance of ocular muscles. It was emphasized that the chief effects of glare were produced on the ground and only became dangerous factors when the pilot went into the air."

II.—JUDGMENT OF DISTANCE.

By Cecil Clements, Wing Commander, R. A. F. M. S.

"The part played by the eyes in the judgment of distance has always keenly interested me, and in the British Medical Journal of December 8, 1906, I called attention to errors of vision as a factor in motar car accidents.

"Observation before the war of private and hospital patients engaged in certain occupations showed that in every case their disabilities were associated with ocular muscle imbalance and by employing a modification of existing treatment with the 'Worth-Black' amblyoscope and the stereoscope the normal balance was again restored within recourse to prisms or glasses, and when this was attained the associated physical symptoms vanished.

"During the latter part of 1916, as ophthalmic specialist to the Fourth Northern General Hospital, I came into contact for the first time with large numbers of officers and cadets of the flying services. It became increasingly evident on examination that these conditions were present in those officers and cadets whose judgment of distance was faulty, and also in a certain number of gunnery officers complaining of similar symptoms.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Investigations at the flying schools revealed the fact that 80 per cent of all crashes in training squadrons occurred while landing machines. An independent inquiry by Graeme Anderson gave almost identically the same figures in two different series, while Rippon found the proportion was 65 to 70 per cent at Hendon Aerodrome.

"At this time I had no special experience of flying and knew little of the visual requirements of aviation. Permission was therefore requested and obtained to study such conditions. It was found that, of all parts of elementary flying instruction, 'landing' provided the greatest difficulties, and that these increased with the newer types of machine which, owing to increased engine power, landed at greater speeds.

"The conclusions arrived at were:

"1. Correct judgment of distance was a necessity in aviation.

"2. That failure to land machine correctly was mainly due to faulty judgment of speed and distance, which was associated with lack of ocular muscle balance and with poor binocular vision.

"3. That from financial consideration alone apart from injury to pupils and pilots it was uneconomical to train such pupils owing to (a) damage to machine, (b) waste of instructors' time, unless something could be done along the lines of my previous experience to help these bad landers to do better, and thus enable them to continue their training and to remain in the flying service, which was then urgently in need of men to meet the combination of war wastage and expansion.

"The following is a brief description of the routine tests used to discover and estimate these ocular conditions which I will not label as 'heterophoria' and so wander into discussion of definitions, but will simply designate together as 'X.'

"*Test for convergence power.*—Hold a pencil in front of the patient at about 1 foot from his eyes, with point on a level with the root of his nose. Tell him to fix the point, then steadily move it forward, watching what happens to his eyes as they converge. What may happen is: (1) Both eyes may converge fixing the pencil until it gets within an inch or two from the root of the nose—that is, no want of convergence; (2) one eye may continue to fix up to an inch or two from the root of the nose, but the other will cease to follow and may turn outward at any distance from the nose—he may or may not see double; (3) on convergence breaking down neither eye may fix and he may look into the distance, stating he sees double anywhere inside 10 inches; further, he may resist by throwing back his head and complaining that it hurts him. In No. 2 he has learned to become monocular and such a response is taken to mean that he has had the trouble for some time.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

In No. 3 the trouble is recent and he has not yet learned to fix with one and ignore the other confusing eye. This condition is found after crashes, influenza, fatigue, and debilitating diseases. Convergence power is estimated by giving the following values: Two inches or under, very good, possibly excessive; 2 to 3 inches, good; 3 to 4 inches, fair; 4 inches and over, poor.

"*Cover test for muscular defect.*—Again ask the patient to fix a pencil held in a similar manner and with the other hand cover one eye with a card, move the pencil from side to side and then uncover; watch whether the eye moves on uncovering. Repeat the test for the other eye in a similar manner. A perfectly balanced pair of eyes will remain fixed on the pencil whether one is covered or not, whereas movement inward or outward on uncovering shows some lack of balance. If there is a convergent or divergent latency, it is described as slight, medium, or marked, and the response to the uncovering may be rapid, medium, slow, or no recovery. This to us signifies a good, bad, or indifferent reflex arc.

"*Red-green test at 20 feet.*—The essential feature is that a suitable tint of red glass in one eye will cut out any rays of light from a green glass and, vice versa, green glass in the other eye will cut out red rays. A slot one-half inch wide by 5 inches long is glazed in the upper 2½ inches with red glass and the lower 2½ inches with green. The person under examination—wearing a pair of reversible frames, glazed red in one eyepiece and green in the other—is told to look at the slot illuminated from behind and asked to state what he sees, and in event of both red and green being perceived, what are their relative positions. A displacement of more than 0.5 of a degree of arc (about 2¼ inches at 20 feet) is not considered good. An exophoric case may give at first an esophoric displacement owing to overcompensation, but as fatigue sets in the red image appears to swing through normal to the exophoric position. Hyperphoria or hypophoria combined with exophoria or esopnoria exaggerates any liability to bad landings. Tendency to neglect one or other eye or each alternately is a marked and frequent feature in bad landers.

"*Bishop Harmon's movable diaphragm test.*—This test has proved invaluable as a check on the others above mentioned. It has been found that a reading of 3 is a 'border line' one, and 5 is bad. First-class landers usually give a reading below zero; average landers, 0 to 2; doubtful landers, 2 to 3; while those giving readings of 3 to 5 or more fall into the category of bad landers. Most of the individuals who landed badly had normal visual acuity and little if any error of refraction.

"I wish to emphasize one point—namely, that I am considering the subject in terms of conditions 'in the air,' and I would ask

Digitized by Google Original from UNIVERSITY OF MICHIGAN

readers to keep an open mind and not judge my remarks too critically by standards which operate 'on the ground.' I ask this for these reasons:

"1. From birth upward all our judgments of distance have been made with one known quantity—our contact with the ground. When, however, the airplane wheels leave the ground the pilot is in space, and this previously known quantity is immediately lost. What is more, before he can successfully land his machine he must make as correct an estimate as possible of the distance he is from the ground.

"2. From the air all verticals are foreshortened and the known size of objects therefore varied from those which we have learned as normal on the ground.

"3. The action of centrifugal force on ocular muscle balance during turns, spins, loops, etc., has to be taken into consideration. If flying in tight spiral, looking in the direction of the airplane's course, or toward the center of the 'funnel' down which one may be traveling, no unpleasant effects will be felt; but if one looks outward—that is, away from the center of rotation—the pain of having one's eyes apparently pulled out of the head is agonizing and a more comfortable position will be rapidly taken up. On coming out of a spin the horizon will appear to be going round in the reverse direction, and if the action has been excessive the pilot may be under the impression that he is not yet out of the spin, and make some further adjustment which results in his resuming spinning in the opposite direction with possible damage to himself, or even fatal results. If a pilot has some tendency to imbalance, then it would seem that rotation will be likely (by putting undue strain on the affected pair) to increase such tendency and to make his judgment faulty.

"In conclusion I would like to make the following observations: The independent investigation of Group Captain Flack, made on air ministry instructions in the war, showed 80 per cent of successes from eye training, and that by only treating suitable cases this percentage has improved since that time. Not only is greater proficiency in landing obtained but also in game shooting and all fast ball games, as the patients attest. The course only occupies a short time daily for three to five weeks.

"The air ministry after careful investigation of results now sanctions the training of service officers who develop the defect; and bad visual judgment, even though visual acuity is up to standard, is now a definite cause of rejection for candidates. Lastly, instructors are sufficiently satisfied with the results to apply at once for an opinion where a pupil shows signs of inability to land."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

NOTES ON AVIATION MEDICINE IN FRANCE.

In the issue of L'Aerophile, a French aviation journal, dated July, 1923, appears an account of the inauguration on June 19, 1923, of the Physiological center for medical examination and study of fliers and equipment at the aeroport of Bourget, France.

The inauguration was characterized by appropriate ceremonies, in which due credit was given Doctors Garseaux and Behague for their efforts in creating and equipping the center. The equipment is complete, thoroughly modern, and includes a large low-pressure chamber with a refrigerating device for the purpose of simulating conditions at high altitudes.

The purpose of this laboratory comprises not only the periodical physical examination of fliers, as provided for by the international convention, but also researches of the physiological problems involved, continuing the study undertaken during the war by Doctor Garseaux. The various devices for the protection of fliers may be tested and developed at this place, thus giving greater security and comfort to aerial navigation.

Although the center is not a part of the military or naval establishment, nevertheless it indicates the important place held by aviation medicine in France.

FELLOWSHIP IN THE AMERICAN COLLEGE OF SURGEONS.

As is quite generally known throughout the service, each year a certain number of medical officers of the United States Navy who have specialized in surgery and who are recommended by the Bureau of Medicine and Surgery, may be admitted, by a unanimous vote of the board of regents, to fellowship in the American College of Surgeons on recommendation of the committee on examinations. In order to meet the high standard of professional fitness set by the college, the bureau demands that all naval medical officers who are candidates for fellowship comply with the requirements for admission imposed by the college on candidates in civil practice.

Certain of these requirements are met by all candidates for admission to the Medical Corps of the Navy prior to commission. Other requirements which the naval medical officer must meet are the following:

"To be eligible for fellowship without technical examination the candidate shall be a graduate of a medical school approved by the American College of Surgeons.

"The candidate shall give evidence that he has served at least one year as interne in a creditable hospital and two years as surgical assistant, or he shall give evidence of apprenticeship of equivalent

Digitized by Google Original from UNIVERSITY OF MICHIGAN

value. Five to eight years after graduation in medicine, devoted to special training and to practice, are normally the time requirement for eligibility to fellowship. Due importance is attached to laboratory and research work.

"The moral and ethical fitness of the condidate shall be determined by reports of surgeons whose names are submitted by the candidate himself, and by such other reports and date as the credentials committee and the administration of the college may obtain.

"The professional activitiy of the candidate shall be restricted to the study, diagnosis, and operative work in general surgery or in special fields of surgery, such as eye, ear, nose, and throat, genitourinary, orthepedics, and gynecology and obstetrics."

As evidence of his qualifications in the technique of surgery, the candidate is required to submit in complete detail, through official channels, the case records of 50 consecutive major operations which he has performed himself.

In addition to the complete records of 50 consecutive major operations, the candidate is asked to submit in brief abstract a report of at least 50 other major operations in which he has acted as assistant or which he has performed himself.

The senior medical officer, with whom the candidate is serving, when forwarding these case records and the abstract of major operations in which the candidate has assisted, shall forward by means of an appropriate indorsement his estimate of the candidate's qualifications for fellowship.

VACCINATION AGAINST SMALLPOX.

A letter discussing the duration of an "immunity" reaction in cowpox vaccination written by the senior medical officer of a hospital ship was recently received by the bureau. In this letter were the following passages concerning a phase of vaccination in which all medical officers are interested:

"I have claimed that 'immunity' disappears at various times and thus after four years, the enlistment period, cases showing an 'immunity' reaction should be revaccinated each year in order to determine if still immune, and if not to repeat vaccinations until successful. I find many medical officers are entirely 'hazy' in regard to 'immunity,' some seeming to think that it is as of long duration as a 'positive,' whereas there is a period influenced by the individual equation, climate, etc., when the 'immunity' disappears. Should there not be more definite instruction in regard to vaccinating in cases of 'immunity'? I have felt that the rule I followed in vaccinating each year in cases of 'immunity' was a safe measure and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

might avoid in some cases the existence of nonimmunes, and then possible smallpox.

"I would ask advice as to whether the bureau wishes me to follow my present opinion."

The Surgeon General's reply to this letter follows and it indicates the bureau's opinion in the matter.

DECEMBER 15, 1923.

MY DEAR DOCTOR: In reply to your letter of December 7, 1923, it may be said that your opinion regarding the indications for repeated vaccination are essentially those held by the bureau. Testing those already protected by vaccination once a year would undoubtedly serve to maintain a greater degree of protection against smallpox among the naval personnel than revaccination every two, three, or four years. However, conditions and circumstances vary, so that it would seem preferable not to establish a fixed rule requiring revaccination every year.

In practice the medical officer, in order to make sure that the crew, for whose health he is in this respect responsible, is thoroughly protected against smallpox, will naturally look at the arms and health records of all men joining the organization. In all cases where there is any doubt as to protection he will revaccinate. He will, of course, have more confidence in immunity reactions observed and recorded by himself or one of his assistants than in those recorded elsewhere. A pitted scar, together with an entry in the health record, indicating that the primary take occurred at a naval training station or elsewhere in the service within two, three, or even four years, make it probable that the man has still a higher degree of immunity. A pitted scar resulting from a primary take in primary-school years does not furnish as strong evidence of protection, and a test for immunity by revaccination is of course indicated. It is proper enough to trust a signed entry indicating a reaction of immunity within a year.

Besides the regular routine handling of drafts of new men coming aboard circumstances usually arise wherefrom a fleet or force order is issued for revaccination preparatory to touching at some port where there is known or supposed to be unusual danger of exposure to smallpox. It therefore happens that most officers and enlisted men while on sea duty will be looked over every year or so. It does not seem advisable to fix definitely by regulation one year as the period which may elapse before revaccination is required.

Your question as to how long immunity lasts can not, of course, be answered without citing exceptions to the general rule. In the majority of cases sufficient protection to prevent the development of smallpox after exposure to any but an unusually virulent focus of infection probably lasts for several years—four to seven years anyway. But that can not be foretold in the case of any given individual. A few lose protection rapidly. Cases have been recorded where exposure to smallpox even in mild form has developed within a few months after successful vaccination, as indicated by a primary take. Infection has also occurred in some instances where exposure has followed revaccination within a few months. Exposure to a virulent case of smallpox is more likely to lead to infection than exposure to the type of the disease generally encountered in the United States and West Indies. In general, the protection against smallpox conferred by vaccination seems to be greater than the protection against vaccination itself. From studies made in the United States and from observations made in Germany during epidemics in recent years it seems as if

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the slight reaction which we call the reaction of inmunity in a protected individual also serves to increase the protection still more. This is true only when a potent virus is used to excite the immunity reaction. The final conclusion is that no procedure will give absolutely uniform and perfect protection, but the incidence of smallpox may be reduced almost to the zero point by recent vaccination with potent virus.

Your statement that you find many medical officers entirely hazy in regard to "immunity" suggests the desirability of preparing another paper on the subject of smallpox and vaccination. A paper will therefore be prepared for early publication in the BULLETIN wherein the epidemiology of the disease and the preventive and control value of vaccination will be discussed briefly in an attempt to clear up some of these doubtful points.

Very truly yours,

E. R. STITT,
Surgeon General, U. S. Navy.

THE INSTRUCTION OF HOSPITAL CORPSMEN.

In September, 1923, the following letter relative to the instruction of hospital corpsmen was sent to the commanding officers of all naval hospitals. This letter sets forth the need of continuing at hospitals the instruction given at the hospital corps training schools, outlines the bureau's wishes in this matter, explains how the desired results might be attained, and summarizes the apparent defects in the method of instructing hospital corpsmen at present employed in the various hospitals.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 19 September 1923.

To: Commanding officer,

Subject: Instruction of hospital corpsmen.

1. Reports received in the bureau indicate that the policy of the bureau in regard to the training of hospital corpsmen is not clearly understood throughout the service. In view of the serious loss of experienced hospital corpsmen and the recent enlistment of a large number of inexperienced recruits, it is considered essential that the methods of instruction should be developed to a high state of efficiency throughout the medical department.

2. Owing to the short period of instruction in the two Hospital Corps training schools, it is impossible for recruits to be given any instruction other than in the fundamentals of the duties which they will be required to perform. Upon this groundwork must be built the practical knowledge and experience which can be obtained only in the hospitals. It therefore has been the policy of the bureau to transfer graduates of the four months' course at the training schools to the naval hospitals where advanced instruction and practical experience is obtainable during the remaining eight months of the first year in the Hospital Corps. The apparent failure to realize that the training in the hospitals should be a continuation of the work of the schools has resulted in a lack of progressive development after the completion of the school course. The immediate consequence of the failure to continue the training of the hospital corpsmen in the hospitals is seen in the numerous failures reported in the

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

cases of those who have taken the required examinations for advancement in rating. This inability to qualify for advancement in rating has resulted in a stagnation of promotions and an excessive number of vacancies in the pharmacist's mates ratings. The lack of experienced hospital corpsmen is being seriously felt throughout the service and has been the subject of a recent communication from the Bureau of Navigation.

3. Opportunities for obtaining practical knowledge and experience in the hospitals are unlimited. In addition to the prescribed hours of instruction required by the Manual of the Medical Department and the Bureau of Navigation Manual, medical officers in charge of wards, laboratories, and other departments of the hospital, chief pharmacists, pharmacists, nurses, and the more experienced hospital corpsmen should personally instruct the hospital corpsmen under their jurisdiction. Such instruction can be given daily during ward visits, application of dressings, administration of routine and special treatments, preparation of dressings and of the patient for operation, administration of anæsthetics, preparation of the operating room for the various types of operations, etc. The majority of these duties can be performed by the hospital corpsmen under the supervision of the medical officer or the nurse, after sufficient instruction has been given in the various methods employed. Without this practical experience and responsibility, hospital corpsmen will never acquire that knowledge of their duties which is absolutely necessary if they are to be of any value to the Navy at smaller stations and on independent duty to which no medical officer is attached. Without this instruction hospital corpsmen are unable to acquire the knowledge required for their advancement to higher ratings in which there are so many vacancies at the present time. Personal interest on the part of officers and nurses in the instruction and advancement of the hospital corpsmen will be repaid by the greater interest and more intelligent performance of duty on the part of the hospital corpsmen themselves.

4. From reports received in the bureau, the apparent defects in the present methods of instruction may be briefly summarized as follows:

(*a*) Instruction is not a progressive continuation of the training received in the Hospital Corps training schools.

(*b*) Constant repetition of the subject matter contained in the present Handy Book causes loss of interest on the part of both the instructor and the hospital corpsmen.

(*c*) The attempt to instruct hospital corpsmen of various degrees of experience, in one group, results either in needless repetition for the older men with consequent loss of interest, or in too advanced instruction for the younger inxperienced men whose previous training does not qualify them for the work.

(*d*) Failure to utilize opportunities for individual practical instruction in the wards, laboratories, operating room, dispensary, and other departments retards the development of the hospital corpsman's training and sense of responsibility.

(*e*) Lack of confidence in the ability of the hospital corpsman to perform the most elementary nursing duties in which he has received training causes loss of interest and of the desire to progress in his work.

(*f*) The present tendency of medical officers and nurses, themselves, to perform ordinary nursing duties, such as the administration of hypodermic medication and the application of simple dressings, etc., results in assigning to hospital corpsmen only those duties usually performed by orderlies in civilian hospitals. As a result of this practice, hospital corpsmen naturally lose interest in their work and fail to acquire the necessary experience which they should obtain before being transferred to the fleet, foreign stations, or to independent duty where the advice and services of a medical officer may not be obtainable.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

5. In accordance with the policy of the bureau as indicated above, commanding officers of hospitals are directed to bring this letter to the attention of all officers and nurses under their respective commands and to issue at once such instructions as will insure adequate, continuous, and progressive instruction to hospital corpsmen. It is further directed that a copy of the instructions issued in compliance with the above order be forwarded to the bureau.

E. R. STITT,
Surgeon General, U. S. N.

Copies of the comments and schedules of instruction placed in effect submitted to the bureau by commanding officers of two naval hospitals are appended. The Surgeon General considers that the formulation of these schedules shows a most commendable spirit of cooperation. If these schedules are adhered to and a personal interest taken in the education of hospital corpsmen by the instructors and medical officers generally marked improvement in the efficiency of the Hospital Corps should result.

UNITED STATES NAVAL HOSPITAL,
October 5, 1923.

From: Commanding officer.
To: All officers and chief nurse.
Subject: Training of enlisted men and recommendation for advancement in rating.
Reference: (*a*) Bu. Nav. Letter N–6–Lo 4111–1413–3 of 21 August, 1923.
(*b*) Bu. M & S Letter No. P–172–42022, ERS/JBC of 19 September, 1923.
(*c*) Bu. Nav. Letter No. N–6–Lo 4111–1413–4 of 25 September, 1923.
(*d*) The instruction of hospital corpsmen directed in conference of all medical officers and chief nurse, under date of October 3, 1923.

1. Referred for the information of all concerned with the request again that all medical officers and chief nurse make every effort possible to train our corpsmen, give them every opportunity for practical work, and when qualified recommend their advancement in rating.

2. There is no more important duty confronting the officers and chief nurse attached to this hospital. It is the commanding officer's earnest desire that each and every person charged with this important duty do their utmost to make the conference result in a satisfactory issue. It is felt that if every person concerned will perform the duties as outlined in conference that our corpsmen will acquire the necessary knowledge and experience, not only to make them a real value to the service but will insure their promotion to higher ratings, increase their morale, and make them a credit to the Hospital Corps.

3. Let everyone do their duty and do it well and then our efforts will be crowned with success. Perfunctory instruction and indifference will result in failure. This duty is vital, urgent, and most important.

4. After reading please initial and return to the undersigned.

E. F. G.,
Captain (MC), U. S. N.

78693—24——6

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

OCTOBER 2, 1923.

INSTRUCTION TO HOSPITAL CORPSMEN.

Instruction will be given to hospital corpsmen on Monday, Tuesday, Thursday, and Friday.

Medical and surgical nursing---------- Nurse.
Materia medica and practical pharmacy---------- Medical officer.
Emergency surgery, first aid, application of splints, dressing and bandaging---------- Medical officer.
Anatomy and physiology---------- Medical officer.
Transportation methods---------- Pharmacist's mate.
Hygiene, sanitation, and prophylactic methods---------- Medical officers.
Medical records, care of instruments and medical stores--- Chief pharmacist.
Asceptic operation, drill sterilization, and preparation of patient for operation---------- Medical officer.

A notation of the time, nature of the instruction given, the name of the instructor and the hour shall be furnished the officer of the day for entry into the journal by the officer concerned.

The master-at-arms will muster the men of the liberty watch at 1 p. m. on the designated days in the recreation room.

Class work will continue until 1.30, when the class will be broken into sections for practical work according to the following schedule.

This section work will continue until 2 p. m. Each section will have two weeks' instruction in one department before being shifted to the next.

SECTIONS.

	One.	Two.	Three.	Four.	Five.
First and second weeks.	Laboratory....	Dispensary....	Office.....	X ray and physiotherapy.	Operating room.
Third and fourth weeks.	Dispensary....	Office.....	X ray and physiotherapy.	Operating room.	Laboratory.
Fifth and sixth weeks..	Office.....	X ray and physiotherapy.	Operating room.	Laboratory....	Dispensary.
Seventh and eighth weeks.	X ray and physiotherapy.	Operating room.	Laboratory....	Dispensary....	Office.
Ninth and tenth weeks	Operating room.	Laboratory...	Dispensary....	Office.....	X ray and physiotherapy.

REPEAT.

In addition to the above formal and practical instruction, all medical officers, nurses, and senior corpsmen will embrace every opportunity daily in the wards, dressing rooms, and special activities to aid and instruct in all those things which they will be expected to know when they are sent on *independent* duty, and to supervise their doing of the same, viz, a corpsman on ward duty should know not only how to keep a ward clean, but also how to make beds, care for the sick, keep bedside records and clinical charts, administer hypodermic and oral medication, give anemas, apply dressings, etc.

Furthermore, it is the policy to rotate duty, so that each corpsman may, so far as conditions permit, become familiar with all phases of the work

B. C. D.,
Commander (M. C.), United States Navy.

Approved:
E. F. G.,
Captain, M. C., United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL HOSPITAL,
12 November, 1923.

From: Commanding officer.
To: Bureau of Medicine and Surgery.
Subject: Instruction of hospital corpsmen.
Reference: Bureau's letter P–172–42022, ERS/JBC, 19 Sept., 1923

1. In reply to paragraph 5 of reference, the bureau is informed that intensive methods are being instituted at this hospital to instruct the hospital corpsmen in all the duties required of them, especially giving them all the practical work possible in the wards, laboratory, dispensary, operating room, etc. It should be remembered, however, that the practical work at this hospital is somewhat limited, but at the same time we have a sufficient amount to enable us to institute very material instruction.

2. The commanding officer realizes very fully the need of adequate instruction for the members of the hospital corps. There is a tendency among many of the members of the corps to minimize the importance of the instructions, and we are trying to eliminate this spirit. We have instituted a series of rewards to those who do well in the classrooms and who show an interest in their work and develop improvement, and to those who do not show an interest methods are to be taken to create an interest. For example, the commanding officer in a talk before the hospital corpsmen stated that it was the plan to give those members of the hospital corps who showed by their interest and as a result of the examinations that they had done good work several days leave at Christmas time and at New Years, one-half going one time and the remainder later. The hospital corpsmen who did not do well in the school work would receive no leave whatever. If this is not sufficient to create an interest in the work, other methods, such as curtailing liberty at the hospital, will be instituted. In other words, it is planned to force these hospital corpsmen to develop themselves whether they want to or not.

3. It is realized that books are not available for all subjects so that each man can have his own book. Of course, they can have the Hospital Corps book. To eliminate this defect somewhat, we have decided to give each student a mimeographed copy of the lecture or other instructions which it is desirable for them to memorize, to be kept in a bound form which they can read at their leisure. This will form the basis of a series of examinations which we propose to hold every four weeks on the work gone over during that period.

4. It is fully realized that in a lecture before hospital corpsmen, many of whom are not accustomed to receive instruction in that way, that they do not retain much of the subject matter, and in order to better insure the retaining of the essential points of the lecture or talk they will have these mimeographed copies of the lecture to aid them. It is thought that this will be of material advantage. It is found that we have two or three corpsmen who apparently will be unable to master any kind of instruction, not as a result of any unwillingness to learn, but simply through the fact that they are mentally not qualified to understand or retain much that is of value. It is planned to submit a letter to the bureau relative to the ultimate disposition of one or two of these cases.

5. There is a tendency among some of the hospital corpsmen to offer all kinds of excuses, such as sickness, duties, etc., so that they may be excused from school. We have practically obviated this feature, as everyone is required to attend the school daily, and if not there promptly disciplinary measures are immediately instituted. It is found that this is necessary in order to insure 100 per cent attendance in the school.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

6. The officers at this hospital are taking interest in the work and it is believed that considerable advance can be attained in a very short time, and I am sure that this is exactly what the bureau desires.

H. I. J.

U. S. NAVAL HOSPITAL,
30 October, 1923.

Schedule of instructions for hospital corpsmen.

	Instructor.
Monday, from 1.30 to 2.30 p. m	Officer of the day.
Tuesday, from 1.30 to 2.30 p. m	Chief pharmacist.
Wednesday, from 1.30 to 2.30 p. m	Officer of the day.
Thursday, from 1.30 to 2.30 p. m	Chief nurse.
Friday, from 1.30 to 2.30 p. m	Officer of the day.
Saturday, from 1.30 to 2.30 p. m	Officer of the day.

The subjects for the instructors are:

Medical officer	Emergency surgery,, first-aid, bandaging, aseptic operations, sterilization, preparation of patient for operation, etc.
	Hygiene and sanitation, prophylactic methods, etc.
	Anatomy and physiology.
Chief pharmacist	Materia medica, pharmacy, records, clerical procedure, transportation methods, etc.
Chief nurse	Medical and surgical nursing.

All hospital corpsmen will attend these lectures daily except Sunday.

The master-at-arms will muster the corpsmen in the classroom and report their presence to the instructor.

All instructors will become familiar with Bureau of Medicine and Surgery letter P–172–42022, 19 September, 1923.

H. I. J.,
Captain, Medical Corps, U. S. N.,
Commanding.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS.

NOTES ON A COURSE FOR INSTRUCTORS OF NURSING.[1]

NURSING.

Notes on theoretical instruction, given by Miss White at Leland Stanford University summer course, June 19 to July 15, 1923.

FAULTS ENCOUNTERED IN NURSING EDUCATION.

1. Low entrance requirements.
 Students do not have sufficient education to grasp the required studies.
2. Lack of teaching atmosphere.
 The demands of the hospital tend to obliterate the essential school atmosphere.
3. Faults of instructors.
 The instructors do not have the proper enthusiasm for their work, and are unable to arouse interest in the student.
4. Lack of knowledge on the part of the teacher.
 Not being thoroughly familiar with her subject, the teacher loses her hold on the class.
5. Lack of the knowledge of teaching.
 Through lack of educational advantages in regard to teaching, the instructors are unable to impart the necessary knowledge.
6. Lack of time on the part of instructors to make the proper preparation for classes.
 Carefully planned instruction demands time for preparation.
7. Lack of time for the students to prepare their lessons.
 No definite study periods are set aside for the student, and study is neglected.

[1] During the past year the Bureau of Medicine and Surgery has approved and financed special courses for 34 Navy nurses, consisting of courses in dietetics, physiotherapy, laboratory work, anæsthesia, and courses for instructors of nurses. These courses have been greatly appreciated, attended with enthusiasm, and the naval hospitals have been benefited by the additional help these nurses have been able to give.

The accompanying notes were compiled by Miss Elizabeth M. O'Brien, nurse, United States Navy, while attending the course for instructors of nursing given at Stanford University, California, from June 19 to July 15, 1923, and it is felt that they will be a helpful guide to not only those who are instructors but to the hospital corpsmen in their studies.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

8. Inadequate teaching facilities.

 Suitably equipped classrooms must be provided in order to carry out the needed instruction.

9. Methods of teaching do not suit the equipment of the ward.

 Only confusion results in the use of different equipment for ward and classroom.

10. Lack of correlation of theory and practice.

 Correlation of theory and practice stimulates interest and makes the subject better understood.

11. No resources to refer to, to broaden the work.

 Properly equipped libraries should supply the needs of instructors and pupils.

12. Too close use of the textbook.

 The textbook supplies information but gives little to stimulate thinking.

References: Brief course in teaching process, by Strayer. Chapter 10, The recitation. Teachers and teaching by Miss Pfefferkorn, American Journal of Nursing, volume 22, page 350. Stimulating students in class work, by Miss Ink, Modern Hospital, volume 15, page 522. Why I teach, by Miss Watson, American Journal of Nursing, May, 1923.

TYPES OF CLASS EXERCISES.

1. Lecture method.
 (*a*) Advantages of the lecture method:
 1. A quick way of getting facts over.

 All the principal points of the subject are collected in the lecture, and can be given very quickly to the student.

 2. Better organization of the subject matter.

 Careful preparation of material tends to carry the lecture along logical and systematic lines.

 3. A good way of putting forth new theories.

 New phases of work can be introduced without disorganizing the subject.

 (*b*) Disadvantages of the lecture method:
 1. No scope for active and creative work on the part of the student. No incentive for thinking.

 The instructor has solved all the problems that the subject presents, and the class takes the material as it is given to them.

 2. The lecture degenerates into a dictation exercise.
 3. There is no way of telling just how much the student is getting out of the lecture.

 Students of poor discernment may miss important points of the lecture.

 Disadvantages may be overcome by a quiz period.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

2. Recitation method. Study precedes this method.
 1. Reporting to teacher by students of the facts they have gained. The teacher has an opportunity of finding out just how much of the assigned lesson is comprehended by the student.
 2. Time for clearing up obscure and difficult points. By example and illustration the teacher can overcome the difficulties that confront the class.

 Two general forms of the recitation method:
 1. Question and answer method.
 Ask questions about the important parts of the assigned lesson.
 2. Topical method.
 Have students arrange material of assigned lesson for issue and discussion.
3. Drill method:
 For purposes of forming habits of thought and action.
 Technique is governed by the formation of habits, which are the result of continued practice.
 The more a pupil realizes the need of good habits, the more attention he will give them.
 He must know what to do.
 There must be a repetition with attention.
 Practice must be accurate.
 Accuracy is hindered by covering too much ground; mental confusion results.
 Drill must be discontinued gradually.
4. Review method:
 Gather points in a series of lectures and organize them into a larger system. This gives the class a clearer view of the topics studied.
 Review preceding lessons. Review that counts is one in which the teacher instructs the pupil, rather than the one where the teacher sits in judgment. Special emphasis on the main facts of the reviewed lesson will enable the pupils to understand better the necessity of study.
5. Demonstration method:
 The teacher does the work. The purpose of demonstration work is to make things clearer. In laboratory work the pupil does the work. It makes them acquire skill, it gives them a clearer knowledge of the subject, it proves hypothesis, it stimulates observation, it gives self-confidence, it increases interest and manual dexterity.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

6. Class conference:

For advanced classes. It gives pupils an opportunity to exchange opinions.

7. Project method:

The pupils must have a problem to solve. The problem or project method involves a satisfying interest and correct thinking. Unless the problem is interesting and the process of solution satisfying nothing can be accomplished by way of the project method.

8. The study method:

The teacher must be a study expert in order to teach the pupils how to study.

NOTE TAKING AND NOTEBOOKS.

Help the student to find the best method of taking notes. Suggestion. Put on the blackboard an outline of the lesson, or place in the student's hand a mimeographic copy of the outline.

LESSON PLANS.

The purpose of lesson plans is to keep interest from lagging and to keep from wandering off the subject. The main object of lesson plans is to obtain the desired result with the minimum amount of time and labor.

PLAN FOR A LESSON.

Find out the aim or problem that confronts the class.

Assemble subject matter. (Be sure to have a thorough knowledge of the subject treated.)

Proceed with your lecture.

Summarize your lecture.

Make provision for references.

Make provision for illustrations.

Ask certain pivotal questions that will make the pupil think. Word these questions carefully so that the answer is not evident.

Avoid asking questions by using the words of the book.

The words of the book hold too much of a suggestion for the answer.

Questions should be clear.

Be sure that the questions need no revision to be grasped by the class.

Do not ask questions in regular order.

The pupils are apt to form a habit of counting up to the question that will come in their turn.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Do not name the student before asking the question.

The attention of the class is held when the student does not know just when he will be called upon to answer.

Do not pick the better students for the answer.

The practice of calling on the better students for an answer makes it easy for the teacher, but it accomplishes nothing toward making the backward pupil interested.

Do not repeat the answer after the student.

It makes students less keen when they know that the teacher will supply whatever of the answer escapes their scant attention.

Do not accept incomplete and vague answers.

Pupils become careless when they realize that a mere inkling of the lesson is sufficient to tide them over a quiz period.

Do not encourage guessing.

Hit or miss answers show very little study.

Reference: Miss Hawkinson. American Journal of Nursing, Volume 10.

CARE OF WARD, GALLEY, HEAD.

Subject: The hospital ward.

Topic: Care of ward, galley, head.

Class: A.

Teacher's aim: To impress upon students the importance of cleanliness and order in the ward, galley, head.

MAIN TOPICS.

A. Ward:
 1. Ventilation.
 (*a*) Definition.
 (*b*) Temperature.
 (*c*) Movement of air.
 (*d*) Pure air.
 2. Lighting.
 3. Heating.
 4. Cleanliness.
 (*a*) Definition.
 (*b*) Why removal of dirt is essential.
 1. It endangers health.
 2. It has a depressing effect upon the patient.
 3. It causes irritation of the mucous membrane.
 4. It spreads disease.
 5. Order.
 6. Weekly field day.
 7. Summary.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

B. Galley:

1. Daily cleaning of galley, including care of dishes, cooking utensils, food containers, ice chest, stove, etc.
2. Accumulation of food.
3. Disposal of garbage.
4. Extermination of insects and mice.

C. Head:

1. Cleaning of bowls, hopper, and enamel ware, bathtubs, nickel ware, and other equipment of head. Care of floors.
2. Necessity of frequent inspection.
3. Care of plumbing.

Article necessary.

1. Basin or bucket of water.
2. Soap, soap powder, Bon Ami, metal polish.
3. Cleaning cloths.
4. Broom, brush, polisher, swab, or whatever is required for the cleaning of the particular kind of deck used in the ward.

A. Ward:

1. Ventilation. (Definition—temperature—movement of air—pure air.)

Defined as continuous introduction of pure air, into a room or building, the mixing of it with the contained air, and the simultaneous extraction of a like quantity of impure air. State average temperature of ward during day or night (64 to 68 degrees). Effects of heat upon the pulse rate. Necessity of movement of air; regulation of air currents. Illustrate by example. Pure air, free from gases and other forms of combustion.

2. Lighting.

State necessity of light regulation after eye operations. Soothing effects of darkness as an aid to sleep and rest.

3. Heating:

Analogous to temperature; overheating causes bad ventilation: overventilation causes loss of heat.

4. Cleanliness:

Definition. Why removal of dirt is essential. It endangers health—depressing effect on the patient—causes irritation of the mucous membrane—spreads disease.

Removal of dirt. Explain how "bacteria ride on particles of dust." State how the art of cleaning is included in, and inseparable from, the art of nursing.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A. Ward—Continued.

4. Cleanliness—Continued.

Proceed to illustrate the method of cleaning the ward. Emphasize the import of removing dirt from corners and obscure places. Explain care of cleaning cloths and the disposal of cloths that are worn and soiled from metal polish.

5. Order:

Illustrate proper position of lockers and locker content; position of chairs, beds, and other ward furniture.

B. Galley:

1. Daily cleaning of galley; including care of dishes, cooking utensils, food containers, ice chest, stove, etc.

Demonstrate proper washing of dishes, cleaning and polishing of cooking utensils and food containers. Supervise cleaning of ice chest. Teach proper care of whatever type of stove is in use.

2. Accumulation of food.

Emphasize the necessity of caring for food and the waste of food through decomposition.

3. Disposal of garbage.

Garbage to be placed in proper receptacle and removed from galley at stated times.

4. Extermination of insects and mice.

Tell about cockroaches and ants, and the proper use of insecticides. Freeing the galley of mice by the use of traps. State how cleanliness and the proper disposal of garbage assist in keeping the galley free of pests.

C. Head:

1. Cleaning of bowls, hopper, enamel ware, bathtubs, nickel ware, and other equipment of head. Care of floors.

Illustrate proper cleansing agents for the different types of plumbing fixtures. Emphasize the destructive effect of verdegris. Teach proper cleaning of floors according to the particular type of floor used.

2. Necessity of frequent inspection.

In order that an accumulation of towels, soiled pajamas, and articles of clothing are not left lying around by patients. In order that bathtubs and bowls will be kept in proper condition. In order that patients be not allowed to linger for conversation and smoking.

3. Care of plumbing.

Reporting of leakage and other defects in fixtures.

Weekly field day:

Thorough cleaning of ward and articles contained therein. Galley, head, quiet rooms, and all articles contained therein to

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Weekly field day—Continued.

be entirely freed from dirt and dust. Inspect each student's detail and make class feel responsible for the general appearance of the ward.

Summary.—Main points of the lesson. Ventilation, cleanliness, order. Method of cleaning.

Reference: Textbooks on nursing. (Harmer, Pope, Maxwell.)

CARE OF PROPERTY.

Subject: The hospital ward.
Topic: The care of property.
Class: A.
Teacher's aim: To teach the necessary care of ward property.
Outline of main topics:

1. Expendable property.
2. Nonexpendable property.
3. The ward property book.
4. How to count property.
5. Wasteful expenditure of property.
6. Summary.

1. Expendable property:

 Use for examples, the expendable property kept in the ward.

2. Nonexpendable property:

 Emphasize the care and importance of nonexpendable property. Illustrate by example the disposal of nonexpendable property that is unfit for use.

3. The ward property book:

 Point out the importance of correct entries for the reception of additional property, and the disposal of property for survey or for storage. Show how to account for property that is sent to be repaired.

4. How to count property:

 Impress upon students the necessity of careful counting of property. Discourage any method that tends toward guesswork. Illustrate by example.

5. Wasteful expenditure of property:

 Cite different ways in which linen, gauze, cotton, and other ward material, is improperly used. Try to make students realize the necessity of proper regard for property under their care.

6. Summary:

 Review main points of the lesson.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The following lesson plan was a class assignment, and the instructor's criticism is noted.

Subject: Bacteriology.

Topic: Introductory lesson.

Class: Elementary.

Teacher's aim: To interest the pupils in the study of bacteriology.

Outline of main topics:

1. Definition.
2. Why nurses study bacteriology.
 - *a.* To learn protection of self.
 - *b.* To learn to protect the patient.
 - *c.* To educate the patient.
 - *d.* To educate the community.
3. Conditions controlling infection:
 - *a.* Condition of the skin.
 - *b.* How bacteria enter body.
 - *c.* Normal protective agencies.
4. Effects of bacteria upon the body:
 - *a.* Destruction of body tissues.
 - *b.* Toxins.
 - *c.* Fever.
5. History of bacteria.
6. Unharmful bacteria.
7. Summary.
8. Assignment.

1. Definition:

 Microscopic forms of plant and animal life called microbes, microphites, micro-organisms, bacilli, micrococci, "bugs," etc. Botanists use name schizomycetes.

 Briefly explain the technical meaning of different groups of bacteria. Illustrate on blackboard single cell, etc.

2. Why nurses study bacteriology:

 Protection of self, patient, community.

 Illustrate by examples.

3. Conditions controlling infection:

 Pathogenic and nonpathogenic bacteria. Condition of skin (broken skin, cuts, pin pricks). How bacteria enter body (mucous membranes, abnormal tonsils, adenoids, respiratory and alimentary tracts. Malarial infection by mosquito). Normal protective agencies (substances in the blood and lymph that destroy bacteria).

 Ask questions; have pupils state their own observation of clean and infected wounds.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

4. Effects of bacteria upon the body:

Inflammation. Destruction of body tissue (suppuration). Toxins (effect). Fever (defensive reaction to combat bacteria and toxins).

Show by diagram invasion of bacteria on body and resistance by fever.

5. History of bacteria:

Important forms of bacteria, known by Muller in 1773, considered interesting by a few experts, called curiosities of the microscope. Ehrenberg advanced scientific grouping in 1830. Sixteen species in four genera were known in 1838. Classification published by Cohn in 1875. In 1876 Cohn had seen spores germinate. Koch and others confirmed this discovery in various species. In 1873, Lancaster theory that different kinds of bacteria occur in one life history. Billroth, in 1874, said that various bacteria are different states of one organism. Discussions arose. Agreement finally that the majority of forms are uniform, showing one type of cell throughout life history. In 1837 and 1843 Schwann and Helmholtz showed that fermentation and putrefaction were intimately connected with organisms derived from air.

First named animalculae—confounded with other small organisms. Cohn's classification still dominates study of bacteria. Explain. Explain meaning of spores and emphasize import of spore discovery. Illustrate by diagram on blackboard the main points of the controversy. Preservation of putrescible substances depend on this principle. Illustrate by example.

In 1857 Pasteur discovered lactic ferment. Pasteur and Cohn proved ammoniacal fermentation of urea, due to micrococcus ureae. In 1862, analogies between fermentation and disease began to be understood. In 1745 by Needham, and in 1777 by Spallanzani, heat experiments on bacteria. Unsuccessful. Specimens swarmed with bacteria a few hours after heating process. Between 1862 and 1872, Pasteur and Cohn made a complete explanation of earlier anomalies of heat experimentation. Result, no putrefaction takes place without the presence of bacteria or some other living organism. Lister, Koch, and others applied the results of germ experimentation to surgery, and observations of the highest value were noted.

Illustrate micrococci of Pasteur and Cohn. Briefly explain sterilization, and show the faulty technique that was probably employed in experiments. State a few of the early steps in surgical technique, and contrast with present-day methods.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

5. History of bacteria—Continued.

At different times the resemblance of fermentation and different diseases had been noted. The idea of virus or contagium, in the nature of minute organisms capable of spreading and reproduction. P. F. O. Rayer in 1850 found anthrax bacilli in dead animals. Also observed by Pollender in 1855. In 1863, with ideas on Pasteur's researches in fermentation, Davaine put forth the opinion that anthrax bacilli caused splenic fever. In 1876 Koch published these observations. In 1870 Pasteur proved that the disease of silkworms was due to bacteria. In 1871 Oertel proved that a micrococcus, already known to exist in diphtheria, was intimately concerned in producing the disease. In 1872 Cohn grouped together a number of pathogenous bacteria, and out of this grew the modern germ theory of disease. Progress up to the present day.

Explain contagium, from Latin contagio. Give short history of contagious diseases, and stress the value of the germ theory.

6. Unharmful bacteria:

Nonpathogenic. Bacteria that produce flavor in cheese and butter.

Illustrate by example.

7. Summary:

Main points of the lecture.

8. Assignment:

First lesson in bacteriology.—Smeeton.

Brief sketches of the life and characters of the men most noted in the early bacteria experiments.—Encyclopedia Brittanica.

Criticism by Miss White: Don't you think that only that part of the history which will arouse interest should be given at this time? They appreciate the history in detail more at the end of the course.

Reference: Curriculum, Standards and methods of good teaching. American Journal of Nursing, Volume 19, Preparation of the lesson plan, by Miss Hawkinson.

THE USE OF TEXTBOOKS.

Textbooks used as a tool.

Contain means of having on hand necessary data.

Present definite organization of material.

Furnishes pertinent subject matter.

Presents a view which one may use as a basis for elaboration.

Presents definite problems.

Indicates trend of educational thought.

Is an aid to the teacher in saving time.

It meets the demands of the conservative and progressive.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Selection of texts.

We should not be influenced by the author. Because the writer of a textbook is considered an authority, it does not follow that the book contains the presentation of material that is suitable for your class.

The person who selects the textbook should have a wide knowledge of the subject and also a knowledge of the mind of the pupil. He should not be influenced by the salesman nor by the appearance of the book. The general appearance of the book, however, should be substantial and artistic, paying due attention to the contents. The statement that a book is widely used requires investigation to find out whether it is gaining or losing ground.

Cost of textbooks.

Not the cost of the book, but the worth of the book, should be the prime factor of consideration.

Persons trained in the required subjects should make the selection of textbooks.

The books should come under the authority of the superintendent in coordination with the teachers who use the books.

Sometimes a book is tested before it is adopted.

Standards for selection.

Exhaustive examination of a text should be made by a competent committee before it is selected. Standards should be applied to the content and organization of the book.

The main justification of a textbook is that it meets the needs of the user.

The purpose of the author is usually stated in the preface.

A textbook should be examined from the standpoint of accuracy and reliability of material. It should be free from bias and dogmatism. Relative values of subject matter should receive consideration. It should be in harmony with the school curriculum. The amount of material contained should be checked. The illustrations should be given attention. The date of the copyright should be noted.

TEACHING OF SCIENCES.

Content of course.

There should be a careful selection of subject matter. The choice of subject matter should fall on such elements as are useful in the pursuit of practical application.

All material should be simple enough to be comprehensible.

It should be associated with the situation in which it is needed.

Teaching.

Teaching of sciences is important as a basis for nursing education.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Benefits derived from study of sciences.
Training in accuracy and observation of statement.
Training in manual dexterity.
Trains student to draw conclusions.
Gives a knowledge of certain specific sciences and laws.
Defects in scientific instruction.
Lack of time for teaching.
Instructors who are not trained in teaching sciences.
Lack of preparation on the part of the instructor.
Lack of application to work.
Lack of laboratory equipment.

References: The Textbook, Hall-Quest. How to judge a textbook. The selection of textbooks, by Maxwell. Chapters 1 and 2.

TEACHING CHEMISTRY.

Reasons for study of chemistry.
It is necessary for the teaching of physiology.
It is used as a basis in materia medica.
Used in teaching cookery.
It should be taught early in the nursing course.
Introductory lesson.
Point out the aim of the course for the pupil.
Show the relation of chemistry to life.
Illustrate changes in matter.
Method of presentation.
Lecture.
Textbook and recitation.
Lecture method.
Covers more ground.
Gives color and emphasis to special points.
Explains difficult points.
Gives more vital illustrations.
Eliminates things that are not vital.
Textbook method.
Textbook method requires an adequate textbook.
It requires working over a large amount of material.
The advantage of the textbook method is that students get more than one point of view, and it makes them more independent.
Laboratory and demonstration method.
Laboratory method is preferable.
Laboratory exercises should coincide with material that precedes or follows the current lecture.
It provides a means of answering a question or questions that are presented in the lecture.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Method of presentation—Continued.
Textbook and recitation—Continued.
Laboratory and demonstration—Continued.
It compels careful observation and thought.
Not too many exercises should be selected for laboratory work.
The exercises should be easy to manipulate.
Teachers should demand that students be accurate and draw conclusions.
Method of giving laboratory directions.
Laboratory manual.
Not practical. It does not offer opportunities for special application.
Oral directions.
Result in confusion and waste of time.
Writing directions on blackboard.
Fairly good. Blackboard locations are not suitable for the accommodation of all the class and time is lost in attempting to read the notes.
Giving directions on mimeograph sheets.
This is the best method, and the one most easily followed by the pupil.
All laboratory notes should be kept.
Entries in notebooks should be made as soon as possible after experiment has been tried out.
Pupils should know something of approximate measurements, because paying too strict attention to nonimportant measurements detracts from the lesson.
Distribution of supplies.
As far as is practicable have individual bottles of supplies for each student.
Laboratory equipment.
Stationary desks 33 inches high, 33 inches long, 22 inches deep. Wood with valspar finish is very practicable for desks. The drain should be at the end of the desk rather than in the center. The window lights should be good. There should be plenty of blackboard room.
Hints about buying.
Deal with reliable firms.
Make out a list of requirements and ask for an estimate.
Have a list of prices ready for consideration. Orders should be sent in annually or semiannually.
Card catalogue all articles bought. Date bought, amount, price, name of firm.
Be careful that corks bought fit the bottles, test tubes, and flasks. In ordering glass tubing, order it to fit the holes

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Method of giving laboratory directions—Continued.
Hints about buying—Continued.
in the corks. Order chemically pure chemicals. Keep triplicate copies of orders.
Laboratory equipment (for the individual student).
Test-tube brush.
Bunsen burner.
Evaporating dish.
Wire gauze, 6 by 6 inches.
Rubber tubing, 2¼ feet.
Ring stand and rod.
Clamp (Burett).
Large ring.
Beaker, 250 cubic centimeters.
Two wide-mouth bottles, 8 ounces.
Funnel.
Two cover glasses, 2 by 2 inches.
Six test tubes.
Thistle tube.
Glass tubing, 12 inches.
Glass rod.
Asbestos square, 12 by 12 inches.
Deflagrating spoon.
Rubber tubing, small.
Rubber stoppers.
Florence flask, 500 cubic centimeters.
Test-tube holder.
Test-tube rack.
General equipment.
Plumbing. Lead pipes are preferable, as acid destroys zinc.
Balance and weights.
Reagent bottles, 8 sets, 5 bottles to each set.
Liebigs condenser, for distilled water.
Electrolysis outfit.
Cork borer.
Wire cutter.
Thermometers, centigrade and Fahrenheit.
Hand lens.
Magnet.
Spoons.
Spatula.
Textbooks (Smead, McLeod, Ottenberg, Peters).

Reference: Rockefeller report, pages 249 to 292, Chemistry. Standard curriculum, Chemistry. American Journal of Nursing, volume 16, page 1208, Needs of chemistry in the training schools, by Miss Parker.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TEACHING BACTERIOLOGY.

Reasons for teaching bacteriology:

Pupils learn to protect themselves. They learn to protect the patient, to educate the patient and the community.

The students have greater appreciation for technique. Interest is aroused by way of laboratory work. There is a better understanding of technical terms employed by doctors in regard to disease. Powers of observation and a scientific attitude is developed.

Economic as well as disease phases of bacteria should be taught. The study should be taken up in the preliminary course of nursing.

By whom taught.

Bacteriology should be taught by a properly trained nurse instructor.

Not only should the students be taught bacteriology, but they should also be taught microbiology.

Method of teaching.

Lecture method (quiz) assigned topics in connection with laboratory work.

One hour lecture.

Two hours laboratory and demonstration.

Divide class in sections for laboratory work.

Ten pupils are a sufficient number for one class. With a larger class microscopical work is difficult to teach.

Forty-five hours are necessary for a course in bacteriology.

Content of course.

Only that which is most vital to the nurse should be taught.

General knowledge, including relation of microbiology to general biology.

Agencies used to check bacteria, method of growth, etc.

Emphasize study of pathogenic bacteria.

Tell how organisms enter body.

Result of invasion.

Question of immunity.

Transmission of disease.

Two classes of students may be working at one time; one class may have demonstration of different types of culture media tubes, while the other class may be inoculating culture media.

The students should be taught the mechanism of the microscope before they are permitted to use it.

Have students draw what they see through the microscope.

Consider all organisms pathogenic.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Laboratory equipment.
Microscopes, high and low power. (One microscope for every two pupils.
Good light for microscopes.
Tables, comfortable height for the use of microscopes; stools to sit on while examining specimens.
Running water.
Blackboards.
Autoclave.
Ice chest.
Incubators.
Individual equipment.
One thumb forceps.
One platinum needle or loop.
One medicine dropper.
Slides.
Cover glasses.
Cotton.
Lens paper.
Filter paper.
Scalpel.
Soap dish, with glass and drain.
Alcohol lamp or Bunsen burner.
Stains.
Oil for oil-immersion lens.
Petri dishes.
Test tubes.
Fermentation tubes.
Culture media.
One set of stains is sufficient for every three or four pupils.

References: American Journal of Nursing, volume 16, Teaching of bacteriology. Modern Hospital, volume 9, Teaching of bacteriology. Textbooks: Coons, Marshalls, Buchanan, Jordan, Smeeton). Yeasts and molds, by Conns. Applied biology, by Bigelow. How we resist disease, by Broadhurst. Sources and modes of infection, by Chapin. Bacteriology, by Hiss and Zinser. Preventive medicine and hygiene, by Rosenau.

Time must be had to prepare the lesson.
The lesson must be practical.
Lesson must be illuminating to the problem at hand.

DRUGS AND SOLUTIONS.

Arithmetical difficulties.
It is best to assume that the class know nothing about arithmetic. Make your plans as simple as possible for teaching the systems of measurement. It is best to teach the apothecaries' system first, then teach the metric system.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Class periods should be for 1½ hours.

Give 30 minutes to common drugs, different types and preparations; 1 hour should be given to laboratory work. Later on in the class, give 45 minutes to the action of drugs, and 45 minutes to laboratory work. At the end of the class give more time to the commoner drugs and less time to laboratory work.

Equipment (chemistry or bacteriology laboratory).

One set for every two students.

Scales.
Apothecaries' and metric weights.
Graduates, glass, various sizes.
Graduates in apothecaries' units.
Graduates in metric units.
Measuring spoons.
Medicine droppers.
Minim graduate.
Glass rod.
Pitchers.
Hypodermics.

Reference: Standard curriculum. Drugs and solutions. Modern Hospital, Volume 15. A symposium on pharmacy for nurses.

TEACHING HYGIENE.

Teaching hygiene is often a failure because the proper facilities for carrying it out are not available.

Public sanitation can be enforced.

Personal hygiene must be convincing.

Aims of personal hygiene.

It succeeds in establishing in the students, habits that will lead to health.

It makes them understand the laws of health better, and thus they become better health teachers.

They should be made to feel their social obligation.

It arouses a sentiment in the school toward those who become ill through their own fault.

The teacher of hygiene should be enthusiastic over her subject.

The proper teacher is a physician who is interested in the pupils.

The pupils should be graded according to the amount of practice they carry out.

Teach hygiene during the first year. Introduce whatever anatomy and physiology is necessary for illustration.

References: Personal hygiene applied, by Williams. Physical education, by Williams. Public and personal health, by Ritchie and Emerson. How to live, by Fisher and Fisk. Standard curriculum, Chemistry. Pamphlet by Doctor Storey, A general outline and syllabus on hygiene.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NURSING.

Notes on practical procedures, given by Miss Walsh at Leland Stanford University summer school, June 19 to July 15, 1923.

OUTLINE OF COURSE FOR STUDENT NURSES.

Admission, transfer, and discharge of patients. According to plan of hospital ward and room; ventilation, light, heat; furniture and utensils; cleaning soaps and polishes; methods of cleaning, dusting.

Linen:

Care of soiled linen; removal of stains, demonstrated.

Linen closet, care and arrangement. Care of torn linen. Laundry.

Hospital supplies:

Cost; necessity for conservation.

Care and handling of dressings; care of dressings after use. (All gauze is washed and sterilized for further use.)

Central supply room. (A large, centrally located room, for issue and accountability of supplies.)

Garbage, source and waste.

Bed making:

Various kinds of beds.

Care of bed after dismissal of patient.

Devices used in bed for the comfort of the patient.

Appliances, use and care.

Care of patient:

Care of clothing and valuables.

Baths, bed and tub. (Care of head, hands, feet, and nails.)

Dressing and undressing.

Moving and lifting.

Application of binders.

Evening care.

Care after death.

Bed sores:

Immediate and predisposing causes of bed sores.

Preventative and other treatment.

Observation of symptoms:

General appearance of patient on admission, deformities should be noted.

Objective and subjective symptoms.

Preparation of a patient for general examination.

Enemata:

Purpose. Various kinds used. Condition of patient.

Intestinal irrigation.

Colonic irrigation.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Proctoclysis.
Douches.
Temperature:
Production of heat in the body.
Varieties of fever.
Method of taking temperatures.
Pulse:
Respiration.
Charting.
Counterirritants.
Collection of specimens.
Medicines.
Practical administration of medicines.
Advanced nursing procedure.
Hypodermics.
Catheterization.
Anatomy of the urinary organs.
Bladder irrigation.
Preparation for surgical dressings.
Preparation of patient for operation.
Postoperative care.
Lavage and gavage.
Alcohol and tepid sponges.
Packs, hot and cold. Partial packs.
Preparation for different forms of surgical treatments.
Aspiration.
Transfusion.
Blood cultures.
Lumbar puncture.
Giving of arsphenamine.
Giving of neo-arsphenamine.
Additional discussion.
Structures involved in acts of skill.
How far to make nursing practice automatic.
General possibilities of teaching nursing.
Present situation and difficulties of teaching.

References: The psychology of management, by Gilbreth. The principles of scientific management, by Gilbreth. Theory and practice of scientific management, by Thompson. Education for initiation and originality, by Thorndyke. Modern hospital, June, 1919, possibilities of standardizing hospital technique. Modern hospital, June, 1923, teaching practical nursing, by Miss Harmer. Nursing textbooks, Pope, Maxwell, Saunders, Jamme, Wheeler, Harmer. Bodily effects; pain, hunger, fear and rage, by Cannon. Nightingale notes on nursing in the hospital, by Henley. Method of teaching, by Parker.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CATHETERIZATION AND BLADDER IRRIGATION.

Review anatomy of the urinary tract.

Give reasons for catheterization; stitches, preoperative, postoperative, etc. Retention and suppression of urine. Concentration test, ratio, urea.

Means used to induce patients to void; psychology, drinks, etc. Reasons for sterilization; bacteria.

Trays:

Use if possible white enamel trays.

White enamel solution basin, containing boric acid (2 per cent).

Instrument container for the sterilization of catheters.

Catheters. Use a short piece of rubber tubing on the end of glass catheter.

Curved basin for soiled sponges.

Hemostat or sponge forceps.

Have tray covered with a sterile towel.

Procedure:

Drape patient with top sheet in the form of a V.

Use chest blanket for warmth.

Scrub hands from three to five minutes.

Cleanse parts around the meatus, using boric solution.

Use forcep to handle sponges.

Gently insert the catheter. (Never collect less than 4 ounces of urine for a specimen.)

After catheterization and before removing catheter, attach triumph syringe, and inject silver nitrate or argyrol.

NOTE.—Have solution of silver nitrate or argyrol in a medicine glass, pour through syringe into the bladder. Do not use plunger on the syringe.

Bladder irrigation.

Give reasons for bladder irrigation.

If possible have glass irrigator for solution. Glass is an advantage in that the amount of solution going into the bladder can be seen. Have temperature 105°. Sterilize thermometer by wiping it with alcohol.

Catheterize patient. Without removing catheter, attach tubing from irrigator, and be sure that the bladder is well filled with solution before allowing it to empty. This is important in order that all parts of the bladder lining be reached; 12 to 14 ounces is usually sufficient to fill the bladder.

After irrigation allow argyrol or silver nitrate to run into the bladder.

Use rubber gloves for isolated cases.

Have students read the urinary reports.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Collection of urine.

1. The bedpan or other receptacle must be clean. The ordinary specimen bottle, holding from 4 to 6 ounces, must be clean, and securely corked. The specimen slip should be filled out in every detail, and attached to the bottle when sent to the laboratory.
2. An admission and preoperative specimen is collected for every patient, except when otherwise ordered.
3. Other specimens collected only as per order.
4. Labeling of urine collections:
 a. In all cases note and record the time the collection commences, as well as the time it finishes.
 b. Especially in short time urine collections, over a period of from one to six hours, it is of the greatest importance that the record be most accurate.

 Example.—A series of two hourly collections are to be made, beginning at 6 a. m. It is unlikely, even with the best of care, that it can be collected exactly at 8 a. m., 10 a. m., 12 m., etc. If the accurate time is given, however, the proper corrections for these unavoidable irregularities can be made in the laboratory. This can only be done if the report is accurate. Labels should read something like this:

 6.02 a. m.– 7.58 a. m.
 7.58 a. m.–10.03 a. m.
 10.03 a. m.–12.01 p. m.
5. Twenty-four-hour specimens of urine:
 a. Start collection at 6 a. m. Have patient void a few minutes before starting collection. Discard this first urine. Save all urine for the following 24 hours.
 b. All 24-hour specimens of urine must be collected in gallon bottles, containing the proper preservative.
 1. Diabetic: Bottle must contain 20 c. c. of sulphuric acid 5 per cent.
 2. Albumen: Bottle must be rinsed with 40 per cent formaldehyde.
 3. For other urine collections no preservative is required.
 c. Each specimen bottle must be tagged with patient's name, room, bed number, doctor's name, date.
 d. Get definite order as to laxative; purgatives are often contraindicated in the collection of a 24-hour specimen.
 e. Send whole specimen to laboratory. Record time on bedside chart.
6. Concentration test.
 a. First day:
 1. Patient to have breakfast. After breakfast, dry diet. No fluids are given during the day or night.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Collection of urine—Continued.

6. Concentration test—Continued.

a. First day—Continued.

2. At 6 p. m. patient voids. Discard this urine.
3. After 6 p. m. until next a. m. patient is not to void, but if urine can not be retained, have patient void into a specimen bottle prepared for the purpose.

b. Second day.

Have patient void into a specially prepared specimen bottle.

c. Send whole specimen to laboratory, properly labeled. Record time on bedside chart.

7. Concentration and ratio test.

a. Follow first day routine of concentration test.

b. Second day.

1. 6 a. m. collect specimen of urine.
2. No breakfast.
 a. Male patient voids directly into bottle specially prepared.
 b. Female patient is catheterized.
3. After collection of 6 a. m. specimen, patient drinks slowly 500 c. c. of water, in which a varying amount of urea has been dissolved. The patient then drinks 250 c. c. of water, making 750 c. c. in all.
4. At 7 a. m. have patient void; discard urine. The patient then drinks 500 c. c. of water.
5. At 8 a. m. have patient void; discard urine. The patient then drinks 500 c. c. of water.
6. At 8.45 a. m. nurse takes patient and specimen of urine to laboratory.

8. Phenolsulphonephthalein test.

a. Have patient drink at least 500 c. c. of water.

b. Have patient void as soon as possible after drinking water, discard the urine.

c. From 15 to 45 minutes after patient drinks water the nurse injects phthalein 1 c. c. into lumbar muscle or into deltoid muscle, using record needle. Important points to remember:

1. The amount of phthalein must be very accurately measured.
2. The injection must be really into the muscle and not into the subcutaneous fat.
3. A long needle is necessary. An unusually long one for fat people.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Collection of urine—Continued.

8. Phenolsulphonephthalein test—Continued.

c. From 15 to 45 minutes, etc.—Continued.

4. The needle must be directed at right angles to the body surface. It is often necessary to drive it into the hilt in order to be certain that the muscle is really reached.

d. As soon as needle is withdrawn, record time on chart. This must be accurate to within one minute.

e. One hour and five minutes later instruct the patient that the first collection of urine is to be made in a few minutes, and try to get the patient to completely empty the bladder, exactly 1 hour and 10 minutes after injection. Label this specimen No. 1, and record time of injection and collection of urine.

Example.—Specimen No. 1; injection 3.05 p. m.; collection 4.15 p. m.

f. Have patient drink at least 250 c. c. of water.

g. Exactly one hour after collection of specimen No. 1, have patient void. Label this urine specimen No. 2, and record time during which collection was made.

Example.—Specimen No. 2; 4.16 p. m. to 5.15 p. m.; accurate to within 1 minute.

h. Patient may have meals during treatment, including fluids in generous quantity.

i. Send the two specimens, each properly labeled, to the laboratory. Record time on bedside chart.

CYSTOSCOPY PREPARATION.

a. Liquid or light breakfast, include milk.

b. Water by mouth 250 c. c. 1 hour before cystoscopy. Repeat just before going to cystoscopy room.

c. No local preparation required.

PROCEDURE FOR FRACTIONAL REMOVAL OF STOMACH CONTENTS.

Two methods employed.

Articles necessary:

Rhefus tube, attached to rubber tubing with silk thread.
Small basin with cracked ice for rhefus tube.
Curved basin for mouth discharges.
Triumph syringe.
Four sterile specimen bottles, plugged with cotton.
Flask with 500 c. c. of 2 per cent barley water.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Procedure:

Rinse mouth with cold water. Tube to be swallowed to a given mark. After 10 minutes attach triumph syringe to tube and remove stomach contents. Tube to be left in place, clamped off with a forcep.

Give barley water drink without removing tube.

Fifteen minutes after taking barley water the second specimen is removed.

Fifteen minutes after the second specimen, a third specimen is taken.

Fifteen minutes after the third specimen, a fourth specimen is obtained.

The four bottles are correctly labeled, and sent to the laboratory for examination.

The students are taught to read the reports that come to the ward.

REMOVAL OF STOMACH AND DUODENAL CONTENTS, LYON METHOD.

Articles necessary:

Tube packed in ice.

Three bottles with perforated corks.

100 c. c. of sterile magnesium sulphate 25 per cent solution.

Litmus paper.

Curved basin for mouth discharge.

Procedure:

If possible turn patient on right side.

Tube to be swallowed to a given mark.

Fasting contents to be removed by aspiration.

First specimen to be marked "fasting contents." (Tube to be clamped off and remain in place.)

Elevate foot of bed, or fix hips higher than head.

Have patient drink a glass of water, and while water is being drunk, push the tube on into the duodenum. It takes about 15 minutes to get the tube through to the pylorus.

One syringe of air is forced through the tube to inflate the duodenum. The syringe is removed and the second bottle is attached to the tube. The bottle is then placed on a low stool by the bedside.

The fluid is tested to be sure it is not acid. The color of the fluid should be a pearly gray; 1 or 2 c. c. should be collected. This makes specimen No. 2.

Between 50 and 100 c. c. of megnesium sulphate is now injected through tube. The third bottle is attached; aspiration is made with bulb syringe, and from 10 to 20 c. c. of bile flows into bottle. This makes specimen No. 3. The tube is removed and the patient put in a comfortable position.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Cleansing of tube:

To be washed with cold water, flushed out with syringe, washed in warm soap and water, dropped into boiling water for a minute or so.

NASAL FEEDING.

Determine whether tube is in the trachea or esophagus, by placing end in a glass of water. Bubbles will appear in the water if the tube is in the trachea.

INSULIN.

In January, 1922, insulin was first used. It is a solution of the active principle of the beef pancreas. H 10 was the first preparation. H 20 is the preparation now in use. It is administered subcutaneously, never intermuscularly. Iodine should be used in the skin preparation, alcohol causes insulin to coagulate; 1 c. c. of insulin contains 1 unit. It is given in increasing doses, 15 minutes before, or 15 minutes after meals.

Sample chart for insulin cases.

Name.	Day.	Date.	Hour.	Dosage.
				c. c.
----------	Monday----	----------	----------	1
----------	Tuesday----	----------	----------	1. 2

Patient. The dosage of insulin is figured out according to age, height, weight, sex.

Diet:

Atwater's table is used in diet.

Bran cakes, agar jellies, thrice-cooked vegetables, mineral oil mayonnaise, coffee, tea.

A twenty-four hour specimen of urine is collected from each patient every day.

Urine analysis, and analysis for blood sugar, are important.

The doctor guides the dose of insulin by the decrease of sugar in the blood and urine.

Reaction is indicated if the blood sugar falls to 0.05.

Symptoms of reaction: The patient is very hungry, very thirsty; there is profuse perspiration and possibly hysteria.

Treatment for reaction: Large dose of insulin. Glucose 1 tablespoonful in lemon or orange juice. Sweet chocolate.

The effect of this treatment is instantaneous.

Treatment for coma: Large dose of insulin; Epenephrin, 1–1000 solution. Effect: Decreases sugar in the blood and urine.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

LESSON PLANS FOR PRACTICAL PROCEDURES.

Object of lesson plans:

1. Arousing interest.
2. Developing thinking power.
3. Promoting observation of patient.
4. Developing right attitude toward patient.
5. Help in development of habits of system.

Outline for lesson plan:

1. Object.
2. General or local effect.
3. Important points to remember.
4. Articles required.
5. Preparation of patient.
6. Procedure.
7. Result.
8. Observations.
9. Charting.

LESSON PLANS ACCORDING TO THE ABOVE OUTLINE.

Hypodermic injections. Subcutaneous.

Object:

For prompt action of a drug.
When a drug can not be taken by mouth.

General or local effect:

Hypnotics, usually for general effect or remote local effect.
Local anesthetics.

Important points to remember:

Needle to be sharp and straight.
Sterilization of needle and syringe.
Avoid injection over a bony prominence, or in the course of blood vessels and nerves.

Articles required:

Alcohol lamp, or other apparatus for use in sterilization.
Spoon.
Hypodermic syringe.
Sharp needle.
Alcohol 70 per cent.
Cotton or gauze sponges.
Whatever drug is to be administered.

Procedure:

Sterilize needle by boiling.
Sterilize syringe by immersion in alcohol or by boiling.
Dissolve tablet by dropping into spoon containing 10 or 15 minims of sterile water; draw solution into syringe.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Procedure—Continued.

Sponge fleshy part of upper arm with alcohol; hold flesh between finger and thumb; insert needle almost full length into the skin; force solution from syringe; gently withdraw needle. Hold sponge over point of injection for a few minutes.

Result: According to medicine given, note result.

Observations: Observe idiosyncrasy for drug, or other unusual manifestations.

Charting: Record time when hypodermic is given; record result and observations.

NOTE.—This lesson plan is limited. It can be made very extensive by introducing the subject of bacteria to emphasize the importance of sterilization; anatomy to point out the reason for choosing a special part of the body for the injection; the effects of different drugs to stimulate observation.

Sponge bath.

Object: For cleanliness.

General or local effect: Local effect on the skin. General effect on the system, producing a feeling of comfort and refreshment.

Important points to remember:

Unnecessary exposure of patient. The body is to be kept well covered, except the part that is being bathed.

Exhaustion of patient. Bath to be discontinued if signs of weakness occur.

Thorough cleansing and drying of the body surface.

Do not prolong the bath. The patient should be bathed as quickly and thoroughly as possible.

Articles required:

Bath blankets, two.

Hot water bag and cover.

Bath towels, two.

Hand brush, orange stick, scissors.

Soap.

Wash cloth.

Foot tub with hot water.

Preparation of patient:

Have room warm; remove bedclothes except top sheet; pass a bath blanket under patient; cover patient with the second bath blanket, and slip out top sheet from under blanket.

Put hot water bottle to feet.

Procedure: Tuck towel under chin. Wash face, neck, and ears, dry thoroughly. Place towel under arm; wash arm from shoulder to wrist; dry. Put hand in basin, scrub nails with brush, use orange stick, trim if necessary. Treat other arm and hand in like manner.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Cleanse chest and abdomen down to pubic region, being careful to extend well over side toward back; dry. With bath towel under leg, wash from hip to ankle. Bathe other leg in the same manner. Put foot tub in bed, immerse feet in water, scrub toe nails with brush, cleanse with orange stick, trim if necessary. Change water. Turn patient on side; press towel along back close to the bed; wash and dry back. Lastly, thoroughly cleanse genitalia. Remove bath articles and make patient comfortable.

NOTE.—If the patient has been neglected, and the skin requires unusual cleansing, the bath water must be changed as is necessary. If the patient is bathed every day or every other day, and can be easily moved in bed, proceed with the bath in this manner: Wash face, ears, neck; arms and hands; chest and abdomen; back; legs and feet; genitalia. This procedure is simple, and most desirable when many baths have to be given, as it obviates the delay occasioned by changing bath water.

Result: Patient should feel rested and comfortable after bath.

Observations: Note exhaustion or unusual effects of bath. Note abnormal skin conditions.

Charting: Record time bath is given. Record observations.

Eye irrigation.

Object: Cleansing and antiseptic.

General or local effect: Local.

Important points:

Before irrigation the lids should be carefully cleansed to remove any secretions or particles of dust adhering to the lashes, which would otherwise be carried into the sac.

The lids should be gently but well separated with the thumb and forefinger. Avoid pressure on inflamed lids.

In irrigating just sufficient force to dislodge secretions should be used.

The fluid should be directed from the inner to the outer angle of the eye, so as to avoid fluid or discharge flowing into the lachrymal duct.

Avoid touching eye with irrigator.

After irrigation cleanse and dry lids.

Articles required:

Irrigator.

Boric solution 2 per cent, or other medication as ordered.

Curved basins, two.

One for return solution.

One for soiled sponges.

Cotton pledgets.

78693—24——8

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Preparation of patient:

If in bed the patient should be in a dorsal recumbent position, with the head turned slightly to the side to be irrigated.

The lighting should be placed so that the nurse can see sufficiently what she is doing, without allowing a glare on the sensitive eyes of the patient.

Irrigation of the eyes is more effectively carried out if the patient is lying down, instead of sitting up in a chair.

Procedure: Cleanse all secretion from lids and eyelashes. Separate lids with thumb and forefinger. Have patient hold curved basin against cheek to receive return solution. Direct a gentle stream of lukewarm solution from the inner to the outer angle of the eye. Cleanse any secretions that adhere to lids and eyelashes. Wipe dry with cotton pledget.

Result: Amount of discharge or any foreign matter removed by irrigation should be noted.

Observations: Condition of eye as result of treatments.

Charting: Record time of irrigation, result, and observations.

NOTE.—In the treatment of an infected eye, lay particular stress on the danger of carrying the infection to the clean eye. Where both eyes are infected, emphasize the importance of cleanliness and care of articles used for treatment, also care of nurse's hands and the danger of infecting herself.

Reference: Textbooks on nursing, Maxwell-Pope, Harmer, Sanders.

PREPARATION OF PATIENT FOR OPERATION.

Shave. Cleanse with green soap. Apply sterile dressing. The application of the sterile dressing is merely for its psychological effect upon the patient.

Shaving:

One inch beyond the hair line should be shaved for a mastoid operation. Paste oiled silk along hair line to hold hair away from incision.

All shaving should be done with particular care and regard for patient.

Interest pupils in the preparation of patients by telling of personal experiences in preparing patients for operation.

To be emphasized:

Soap for shaving. The area that is to be shaved.

Drinking of water. Fluids to be taken up to 6 a. m. the morning of the operation. Intake of fluids before an operation lessens thirst after the operation.

Drinking of alkaline waters, counteracts acidosis.

The morning of the operation the patient is to go to the surgery in as calm a state of mind as possible.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Postoperative care of patient:

Greatest danger occurs during first half hour after operation.

Do not allow a probationer to watch an ether case.

In an emergency call the doctor. Use artificial respiration. Use tongue forceps if patient swallows tongue. For circulatory failure, adrenalin or epenephrin.

Pneumonia jacket during the first 24 hours after operation.

Patient to be left between blankets until evening, when the operation is performed in the morning. A corresponding number of hours should elapse if the patient is operated upon later in the day.

Temperature of the room should be 68°. It should be well ventilated to accommodate the ether that is eliminated by the lungs.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE.

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge.

Notes on Preventive Medicine for Medical Officers, United States Navy.

REMARKS ON THE EPIDEMIOLOGY OF SMALLPOX AND THE PREVENTIVE VALUE OF VACCINATION WITH COWPOX VIRUS.

A few weeks ago a medical officer whose advice is sought from time to time about health measures in the Scouting Fleet wrote to the bureau and asked, should there not be more definite instructions regarding vaccination, with especial reference to the time that should be permitted to elapse before again revaccinating men who have given immunity reactions? He stated that he has found many medical officers entirely hazy on the subject of immunity reactions, and he feels that the rule followed by him to revaccinate each year makes for safety and may be the means of preventing an occasional case of smallpox. That is undoubtedly true. As Leake has pointed out, "Vaccination is like oil on a good machine; it should be applied little and often."

Revaccination in the case of an individual who has given a reaction of immunity within a year or two is without danger and causes either no physical discomfort at all or such a trivial amount that no individual can raise plausible objection on these grounds if vaccination is properly performed, as it should be, with a minimum degree of traumatism. Nevertheless, many people do object to the frequent repetition of such procedures even though they be but little inconvenienced thereby.

When all is said and done, unless revaccination every year can be justified as a measure of necessity, or unless it can be logically maintained that everybody must and should be revaccinated every year to insure the prevention of an occasional case of smallpox that would otherwise occur, it is hardly advisable to promulgate regulations or instructions to that effect. Circumstances necessarily alter cases. Many of the personnel, enlisted men as well as officers, for long periods are not subjected to exposure to smallpox in such virulent form as to overcome the protection afforded by successful vaccination two, three, or even several years previously. On the other hand, regardless of whether last vaccinated 12, 24, or 36 months ago

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

it may become advisable at any time to revaccinate the personnel at some particular station, or the crew of a ship, or all members of the command in an entire fleet, because unusual danger of exposure to smallpox is known or presumed to exist. In fact, when smallpox is present in epidemic form or known to be endemic and actually prevalent it is justifiable to require revaccination even though the individual may have had an accelerated take or an immunity reaction within 12 months.

General instructions must provide for all contingencies. It is not desirable that they be unnecessarily rigid in their requirements. In civil public health practice revaccination of the entire population every seven years would be regarded as a great step toward complete protection against smallpox. Revaccination every four years would be wonderful. The last is a natural requirement for enlisted men of the Navy.

As a matter of fact, in the ordinary course of events the majority of men attached to crushing ships or serving at foreign stations will be revaccinated every year or so. Medical officers are expected to make sure that every man who joins the organization is protected against smallpox. If the man's health record does not contain a signed entry for an immunity reaction within a year or so, revaccination should be performed to determine that he is immune. A record of a take within two or three years furnishes presumptive evidence of protection, but, as a rule, in such cases it is desirable to test for immunity reaction since it is little trouble to revaccinate and it causes the man little or no discomfort. It is natural also to revaccinate every new man coming on board whose health record does not indicate recent vaccination, in order that the vaccination record may be brought up to date, the health record placed in the permanent file and no further thought be required on that account for a long time to come. The rate of personal turnover brings so many new men to the organization that this course alone continuously insures that most of the crew will be found at any time to have been revaccinated within two years at the most. So many circumstances arise and lead to revaccination from time to time on account of supposed danger of smallpox, and so many circumstances would interfere or make it inadvisable to revaccinate at the expiration of a definitely fixed period, that it is better to rely upon the discretion of the medical officer of the organization who naturally is expected to inform himself as to the proper course to follow. It is the purpose of this article to assist those who have not completely formulated their ideas regarding the value of the immunity reaction and its use from the administrative standpoint.

The manual of the Medical Department requires that officers shall be revaccinated at least once in every seven years. That conforms

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to good civil public health practice, barring the presence of an epidemic, but many individuals lose immunity in the course of seven years to the extent that some degree of accelerated take instead of an immunity reaction will result when revaccinated.

It is generally considered that immunity established against cowpox virus means at least equal protection against smallpox virus. In fact, there is some evidence, epidemiological in nature, that the immunity conferred by the various degrees of reaction to cowpox virus is even more certain to protect against smallpox virus than against cowpox itself. However, it would certainly be unwise for a person who has not been revaccinated in six or seven years to expose himself to smallpox.

The age of the individual must be taken into consideration. Officers as well as enlisted men will be revaccinated more frequently in their earlier years, so that by the time they reach middle life they will have had their immunity stimulated several times and most of them will have responded repeatedly with immunity reactions. The intervals can then be lengthened with comparative safety. Revaccination should be performed regardless of age if exposure to smallpox is likely to occur.

When an individual, sometime in the past immunized to cowpox virus, is exposed to smallpox under natural conditions, infection will depend upon at least two factors of determining importance besides the existing state of immunity. The first is dosage—the mass of virus finding lodgment in a portal of entry. The second factor is the degree of virulence of the invading virus. The term is used here in the broadest sense to include ability to adapt to the juices of the host and multiply as well as ability to invade the tissues and produce disease; that is, the power to cause a severe clinical type of smallpox rather than a mild infection. Doubtless the question of repeated exposure is also of importance, since it is conceivable that local tissue barriers or chance conditions in the portal of entry may serve at one time to prevent actual invasion of the tissues, whereas at another time effective barriers may not attend exposure.

After the primary take, as a rule, immunity is retained for many years, at least to a degree that prevents an accelerated reaction when potent cowpox virus is inoculated into the skin. In other words, for many years after successful first vaccination the rule is that only reactions of immunity will follow subsequent inoculations. There are exceptions, of course. Some individuals have reacted with accelerated takes in less than four years after the primary take, and there are cases of smallpox on record which were contracted from a few months to three years after successful vaccination. For that matter, a second attack of smallpox can occur within a few months.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

More rarely, individuals are seen who give no reaction with presumably potent virus, several times repeated—neither an immunity reaction nor any degree of accelerated reaction. Once in a while such an individual will be found with a typical pitted scar indicative of a primary take. More often there is no scar. A number, perhaps a majority, of those who fail to have any kind of reaction give a definite or presumptive history of smallpox. These negative reactors appear to be more common among negroes and Filipinos than among whites. Whether such an individual has some *kind* or *degree* of immunity to smallpox can not very well be determined. If there is a pitted scar a certain amount of protection is probable, and it is possible that the individual would not become infected if exposed to smallpox. There is no way of telling short of actual inoculation with smallpox virus. Furthermore, if that were done and inoculation into the skin led to a mild case of smallpox, it could not be concluded that the individual would have had a mild attack if infected by natural means with the virus gaining entrance, presumably, through the mouth or nose. Information furnished by those who have had smallpox after unsuccessful attempts at vaccination is of interest in this connection, although of course it can not be determined that a potent virus was used or that the technique was beyond question. However, it does seem likely, in some cases at least, that the virus was potent and the inoculation satisfactory. A number of Filipino mess attendants who have failed repeatedly to react to cowpox virus have given such histories. Those referred to were vaccinated on board ship with different lots of virus, presumably potent, although it was not practicable to determine potency. It seldom is possible to vouch for the potency of virus on board ship, because very few men get on board without having been successfully vaccinated, and consequently no susceptibles are available to demonstrate primary takes. No lot of virus can be regarded as fully potent unless it is giving 100 per cent of primary takes in a series of previously unvaccinated individuals, preferably children.

A complete explanation of the meaning of the various degrees of takes is not to be found in the demonstrable results of experimental work. It is necessary to turn to general theories of immunity. For practical purposes, all the various reactions, from the primary take (vaccinia) down through decreasing grades of accelerated takes and finally the reaction of immunity, are to be regarded altogether as representing merely differences in degree and not different types of reactions. If the vaccinated individual is sufficiently immune, the reaction of immunity reaches its height of intensity within 24 hours. With less immunity the reaction begins less promptly, as a rule, but in any event more time will elapse from the moment

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of inoculation to the day of greatest intensity. The chief consideration is the time when the reaction reaches its greatest intensity.

We are indebted to Leake, of the United States Public Health Service, and to Force, of California, for extensive studies of the phenomena of vaccination as well as for the collection of much evidence relating to the preventive value of cowpox virus and review of literature concerning smallpox. We are also indebted to Lieut. Edwin Peterson, Medical Corps, United States Navy, for the studies made by him with carefully controlled observations among several thousand recruits vaccinated at the naval training station, Great Lakes, Ill. The observations of other medical officers of the Navy have been useful also in confirming the practical value of the immunity reaction. Peterson observed that the reaction of immunity is not to be trusted as an indication of protection unless the cowpox virus used to excite the reaction is known to be potent. Leake points out that a virus which is entirely dead, judged by its failure to produce primary takes on previously unvaccinated subjects, may frequently be capable of giving a reaction of immunity in cases where a fully potent virus would go on to the production of some degree of accelerated reaction ("take"). One can not feel altogether satisfied with the immunity reactions he is getting unless he has reason to believe the virus is potent. Leake puts emphasis on the statement that it is the day of greatest extent of the redness which is the important criterion in differentiating the various reactions; not the time when the reaction begins. If the reaction is definite and appears in a few hours (immediate reaction) and the greatest extent of redness is reached promptly inside of 24 hours, it is to be interpreted unquestionably as an immunity reaction.

In a great majority of all instances, when the reaction appears promptly and is pronounced and typical before the end of 24 hours it will be found that the greatest intensity, in point of fact, has been reached and no further development will take place. Leake cautions that the potency of the virus is an important factor and that with a fully potent virus, as defined above, reactions do sometimes appear promptly and yet go on to the development of a mild degree of accelerated take, whereas with a virus that is somewhat less potent the reaction would stop suddenly. A possible explanation for this is offered below in connection with a brief discussion of theories of immunity that may apply. As a matter of fact, the difference in the effect of fully potent virus and less potent but not dead virus is not very great so far as the degree of reaction caused is concerned. If the reaction appears promptly and reaches a definite or considerable degree of intensity within 24 hours it certainly indicates that the individual has a very considerable degree of immunity. A fully potent virus might not be completely destroyed by the tis-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sues in 24 hours, but it would not survive and retain enough power to cause more than a mild degree of accelerated reaction. Of course, it is desirable to use a potent virus, for the reason that the longer the virus is able to survive and multiply the greater the stimulation to additional antibody production, the more will existing immunity be boosted. It seems from observations among persons exposed to virulent smallpox, and attack rates during epidemics, as though even the very slight excitation associated with the production of an immunity reaction serves to boost already existing immunity when potent virus is used to excite the reaction. As Leake has noted, it is interesting that this immediate slight reaction, first used administratively in the United States as a criterion of immunity, has been recognized by German officials since the smallpox epidemics of 1917–18–19 as indicating the highest degree of immunity conferred by vaccination.

To revert, if the redness at the site of inoculation does not reach its greatest intensity within 24 hours but instead increases gradually up to the third or fourth day the reaction is to be recorded as an accelerated take of slight degree, even though the lesion does not go on to vesicle formation. The inference is that the subject did not have sufficient immunity to stop the reaction at once. With still less immunity a more or less definite period of incubation is to be expected. With the virus multiplying during that period more or less unhampered, the more marked will be the inflammatory reaction when the lesion does develop, depending upon the extent to which the virus has grown in the meantime. The less protection remaining from previous vaccination (or smallpox infection) the more marked the reaction, and the more close the approximation of the whole process to that of a primary take.

The typical reaction characteristic of the primary take can occur but once in the life of an individual—the first time he is successfully vaccinated—and then only providing no degree of immunity has developed either as the result of an unrecognized attack of smallpox or infection during the intrauterine period. Leake's description of the typical primary take is brief and satisfactory. The site of vaccination begins to redden for a millimeter or two around the insertion in about three days. By the fourth or fifth day there is a papule with its central part raised and a red surrounding zone two or three millimeters wide. In this central part there develops by the seventh day, or before, an exudate which gives a grayish color to the now vesiculated or postular lesion. On about the seventh day the surrounding red zone suddenly begins a rapid spread, reaching its greatest diameter 8 to 11 days after vaccination, and it is this widespreading area rather than the vesicle or postule that constitutes the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

most significant part of the process. Within a few hours after the greatest spread of the area has been reached the color becomes somewhat duller and a gradual fading of the area commences. Meanwhile the pustule has become crusted.

In the case of a well-defined accelerated reaction the individual still has some immunity to start with. This results in modifications in the direction of a hastening of the process and a lessening of its intensity.

One naturally desires an explanation of the mechanism, an understanding of what is taking place during these various degrees of the biological reaction between the virus and the tissues of the inoculated individual. We are on fairly safe ground so long as we speak of antibodies and do not seek to use more definite terms. At the same time it is necessary to explain the irritant or toxic substance that actually causes the redness and other manifestations of the inflammatory reaction. Although based entirely upon theory the following assumptions seem to furnish a simple and satisfactory explanation of the entire process. Imagine a susceptible child inoculated for the first time. No antibodies are present to attack or interfere with the virus which consequently proceeds to multiply. During this period no redness develops. Vaughan's theory that the actual poisonous substance is a split-protein product formed as the result of a biochemical reaction between the antigen (cowpox virus in this case) and the antibody, appears to offer the simplest explanation. The idea is that the antibody is a substance in the nature of a ferment which has the specific power of attacking the protein molecule of the virus, causing its destruction and splitting the molecule into at least two portions, one of which is a toxic substance. This toxic substance is not at all specific but it is formed only as the result of the highly specific reaction that takes place between any given antigen and the antibody manufactured by the cells of the host specifically to attack it after that antigen is introduced into the body. In other words, the toxic substance finally formed is believed to be exactly the same, no matter what the protein is. That is, it makes no difference whether it comes from the split molecule of egg-white, serum protein, colon bacillus, pneumococcus, typhoid bacillus, or cowpox virus.

Kolmer describes the cowpox immunity reaction as an anaphylactic reaction. Some students of immunology think that all the phenomena of anaphylaxis can be accounted for on the basis of Vaughan's ferment-antiferment-split-protein theory. Others do not. It doesn't matter because the vaccine immunity reaction is not being accounted for here as an anaphylactic phenomenon. There is this similarity between cowpox vaccination reactions and anaphylactic reactions: the immune substance is attached to or resident in

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the cells. However, the cowpox immunity reaction differs from anaphylactic skin reactions (allergical reactions) in that the reaction does not appear at once—within half an hour—and it is only a matter of gradations from the immunity reaction up through the increasing manifestations of infection to the complete picture of the primary take.

Next, imagine an individual vaccinated only once several years ago, and assume that he will have an accelerated reaction (take) of moderate degree. The virus is inserted, and no reaction is apparent at the end of 24 hours. Antibodies were not available to begin the destruction of the virus, which has consequently begun to multiply. Nevertheless, the cells having been trained at a former period in the life of the individual to produce the required specific antisubstance are able to produce more rapidly and more abundantly. Destruction of the virus will therefore begin earlier. There will be less virus protein to destroy because it will not be able to multiply for so long a period. Destruction of the virus will proceed gradually but at a more rapid rate than if the cells were producing antibody substance for the first time, and total destruction will be effected at an earlier date than in the case of a primary take. These considerations are sufficient to account for lessening of the incubation period, lessened intensely, and rapid transition through all stages of the reaction up to the point of greatest intensity which is arrived at much earlier than in the case of the primary take. This explanation also accounts nicely for the fact that accelerated reactions as observed may be of any grade from those more or less like a primary take down to those which are indistinguishable from delayed immunity reactions.

In the case of an immunity reaction the specific antibody substance is still present, attached to or resident in the cells, and available in ample amount to destroy the virus before any, or at the most very little, growth can take place. The toxic substance yielded by the combination will therefore be liberated almost at once, and the typical irritant action upon the skin as characterized by redness and slight exudation will occur in a few hours, after which there is nothing more to take place because the virus is destroyed. There are various degrees of immunity reactions. One can conceive of enough antibody substance to prevent growth of the virus and yet not enough to split all of the foreign protein forthwith and thus set free all of the toxic substance all at once. With the more gradual formation less intensity is to be expected of the skin reaction. The quantity of virus deposited in contact with the producing cells probably varies a good deal, however careful the technique of vaccination. Naturally the potency of the virus has something to do with determining the intensity of the reaction providing there is not a surplus of anti-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

body substance that will at once destroy the virus regardless of its potency. With less than a completely adequate degree of immunity a fully potent virus may succeed in multiplying for a short time where a less potent virus would fail to grow. This would tend to delay the moment of greatest intensity of the reaction. The intensity actually may not be greater because elimination of the poisonous substance is also going on. Furthermore, there is probably a good deal of variation among different individuals in their response to the irritating toxic substance in question. Different skins react differently to all sorts of irritants; acids, sugar, bites of insects, rays of the sun, etc. It would seem possible in part to account in this way for the fact that a few individuals give little or no reaction when inoculated with potent virus. If there were indeed a lack of immunity the process could be expected to go on to some sort of take. Unfortunately, where there is no reaction there is no visible evidence upon which an estimate of the degree of immunity can be based. It can not be predicted that such an individual would not become infected if exposed to smallpox. The presence of a pitted scar or history of smallpox is reassuring, but more assurance can be obtained by repeating the inoculation with potent virus several times at short intervals to make sure that the failure to produce a reaction was not due to the technique.

Where exposure to smallpox is likely, it is well to remember such individuals, vaccinate them again, and then watch them closely enough to detect the disease at once should they become infected. One can imagine a combination of comparatively slight skin response along with sluggish immunity that is sufficient to destroy the inoculated cowpox virus more or less promptly but not within the time limit of an immunity reaction and without redness indicative of a reaction. Such partial immunity might not be sufficient to protect if exposed to smallpox virus from a severe case of the disease.

It should be mentioned that complement is generally believed to be essential to the reaction between the specific antibody substance formed by the cells and the antigenic virus. The idea is that the specific antibody substance merely sensitizes the antigen so that the complement may attack and effect the destruction. Variations in the availability of complement might therefore account for certain differences in the intensity of reactions.

With the development of immunity incident to successful vaccination with cowpox virus antibodies also appear in the blood stream. Serum taken from rabbits after vaccination has been found to protect susceptible rabbits against the virus.

Cowpox virus is generally believed to be smallpox virus that has become permanently modified by passage through lower animals so that it can not again be made to cause smallpox. Smallpox is a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

disease that occurs only in human beings. Just what the modification is that results from transfer to lower animals has not been adequately explained by any theory advanced. One theory assumes a sexual and asexual cycle for smallpox virus, the sexual cycle not taking place in the lower animals, so that with discontinuance of this form of propagation the virus has become permanently altered, retaining, nevertheless, the property of exciting antibodies that will protect against the original virus, the protein reactions being specifically the same. This is a rather fantastic explanation.

Rosenau states that successful experiments in Germany, England, and the United States, in which smallpox has actually been modified by passing variolus matter through calves, prove positively that we are dealing with two forms of one disease. In previous centuries it was noted that cowpox was often prevalent among farm animals when smallpox was epidemic or prevalent among human beings.

Cowpox virus may be obtained from smallpox. It is necessary, however, to pass the virus through a series of several calves or other lower animals. After only one or two passages its transfer back to a human being is liable to cause smallpox.

Certain terms used in connection with the manufacture of cowpox virus are worth remembering. Glycerinated virus is now used practically altogether in the United States. It consists of the entire vesicle and its contents, rubbed up with 50 per cent glycerine. The vaccine laboratory of the New York City Health Department produces a virus that is never more than four successive transfers through animals from a human case of vaccinia.

According to Park's description, a human-calf-rabbit seed virus is produced as follows: Crusts are collected from healthy children about 19 days after vaccination. These are cut up and emulsified into a paste with boiled water. This humanized seed is then inoculated into a small area of skin on a calf's abdomen. When the cowpox lesion has developed, the pulp (entire contents of the vesicle, exudate, and cells) is removed with a curette and glycerinated. It is then tested bacteriologically and clinically. If satisfactory, this bovine virus from human seed is transferred to a rabbit by vaccination into a shaved area. Five days after vaccination the pulp is removed with a sharp curette, weighed, and emulsified with a solution of glycerine (50 per cent), sterile water (49.5 per cent) and phenol (0.5 per cent), in the proportion of one part of pulp to eight parts of solution. Four rabbits yield 15 to 20 cubic centimeters of emulsion, enough to vaccinate one calf.

The regular supply of vaccine virus for distribution is then produced by vaccinating calves, preferably females from two to four months old, with this rabbit seed. The calves are vaccinated and the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pulp collected under the most careful aseptic conditions. The calves are inspected by a veterinarian, at the time of purchase, for tuberculosis, glanders, foot and mouth disease, tetanus, and skin diseases. After the virus is collected the calves are immediately killed and their organs are examined by the veterinarian. If at autopsy the animal is found diseased the vaccine is discarded.

The calves are kept in sanitary stalls and fed only on milk. No hay or straw is used for any purpose. The stalls are kept flushed with water to wash away dejecta. On the day before vaccination is to be performed the belly wall is cleanly shaved from the cuneiform cartilage to the pubis, and well upon the inner sides of the thighs and on the flanks. The skin is thoroughly washed. Immediately before vaccination the animal is fastened to the operating table and the abdomen and inner surface of the thighs prepared as for an aseptic abdominal operation, with hot water, green soap, alcohol, and sterile water. The skin is dried with a sterile towel, and about 100 small scarifications are made in the prepared area by cross scratches in rows at least 2 centimeters apart. The lesions are allowed to dry and they may be left uncovered or covered with sterile gauze, the animal being kept as clean as possible. As a rule, papules appear within 48 hours after vaccination, and within five or six days, depending upon the rate of development of the vesicles, the virus should be ready for collection. The calf is killed and placed upon the operating table. Full aseptic surgical technique is employed. The vaccinated field is scrubbed with soap, sterile water, and gauze. Crusts are carefully picked off. The soft pulpy mass of the lesions is then removed with a spoon curette and collected in a sterile vessel. The pulp is then glycerinated as described above. This glycerinated stock virus is allowed to stand for three or four weeks at ice-box temperature in order that bacteria, which are invariably present, may undergo dissolution. After that the stock is thoroughly triturated and strained through a series of fine sieves and then put up in sealed capillary tubes.

An average yield is 10 grams of pulp, a quantity sufficient when made up in tubes to vaccinate about 1,500 persons. A calf may furnish material for vaccinating anywhere from 500 to 10,000 persons. Before the vaccine is tubed it is tested for gas-forming organisms, tetanus and streptococcus. After all the laboratory tests for purity have been made and found satisfactory, and not until then, the vaccine is ready for trial upon previously unvaccinated children, all of whom must show a perfect take. If this clinical test is satisfactory the virus is distributed. Clinical tests are made every two weeks while the vaccine is out for general use. If a single test fails the vaccine is called in.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Vaccine should remain potent for at least three months if kept constantly below the freezing point—preferably about 0° F. Extreme cold is not injurious but deterioration goes on rapidly above 32° F.

Some deterioration may take place during the three or four weeks the freshly glycerinated pulp is kept in the ice box for the purpose of allowing bacteria to die out. Fresh virus that has not undergone this period of storage is known as *green virus*.

Vaccination with green virus is sometimes advocated with the idea that greater potency will produce a reaction affording greater protection against smallpox. Leake has gone thoroughly into this subject and finds that it is unnecessary to use green virus. There are definite objections to its use. The bacterial content of green virus is much higher than that of ordinary virus and the resulting take may be more severe as a result of concomitant infection. If there is immediate danger of smallpox in severe form, making the greatest possible increase in the individual's immunity desirable, it should be obtained not by the use of green virus or a large scarified insertion, but by several small insertions which will be more perfectly protected by their overlying scabs and will heal more promptly. Increased antibody production can be stimulated by multiple small inoculations as well as by a large single insertion. As Leake points out, practically perfect protection can be given in the case of an individual capable of responding, by the mildest sort of vaccination, if repeated frequently enough.

Preventive value of vaccination.—It is too much to expect that even recent vaccination will invariably prevent smallpox. Nature, down through the ages of evolution, has not granted all human beings equal power to respond to invasion and produce immune substance, and some apparently lose immunity in a comparatively short time. Fortunately, it is only the rare individual who can not be kept adequately immunized by revaccination from time to time, so with most of the community vaccinated, and with public health activities properly organized and administered, smallpox can be kept down or out altogether with practically complete safety for all.

Immunity develops more slowly after successful vaccination than is commonly taught. The individual is not likely to be fully protected unless he was vaccinated before being exposed to smallpox; in fact, vaccination can not be relied upon unless the height of the reaction incident to a take has been passed before exposure. Nevertheless, it is proper to vaccinate susceptible persons presumed to have been exposed, since vaccination on the day of exposure, if it takes, will furnish enough protection in many instances to modify the course of the ensuing smallpox even if it is too late to prevent infection. It is probable that such late vaccination will actually prevent

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in a certain percentage of cases, especially where the smallpox virus is of low virulence.

Epidemiological considerations.—Smallpox was once the most prevalent and dreaded disease in the world. Before the days of vaccination, according to Rosenau, only five persons out of a hundred escaped it during life, and about a quarter of those who took it died. The virus as passed from person to person quite constantly retained great power of infectivity, and the only factor of determining importance was the matter of exposure. The disease was preeminently a disease of childhood. That is the situation with measles to-day; the virus is so infective from continuous passage through the human family that all who are susceptible become infected *when actually exposed*, regarldess of age, climate, and sanitary conditions.

Rosenau states that few of the acute infectious diseases show such a complete independence of conditions such as race, climate, soil, age, sex, occupation, sanitary surroundings, etc., as does smallpox.

It is stated in Park's Public Health and Hygiene that no infectious disease shows a more complete independence of these conditions than does smallpox. Undoubtedly that was true enough of smallpox when it was pandemic and it might be true at any time during the progress of a rapidly spreading epidemic, but, as seen to-day in the rural districts of poorly vaccinated States and in urban communities of the United States and Europe, smallpox does not by any means spread with complete disregard for climate and sanitary barriers in the environment. True, the virus withstands drying for a considerable length of time, and its perpetuation outside the body is somewhat more certain than is the case with the causative agents of most of the other communicable diseases which are spread through direct and indirect contact. Most new cases, however, result from the transfer of still fresh and moist secretions from the mouth or nose of a person undergoing the incubation period or early stages of the disease. Later in the disease infection may be transferred by material, moist or dry, from the skin lesions. Under ordinary circumstances few persons will be exposed to any given focus in this manner when the disease is recognized or suspected. Dissemination is principally due to mild unrecognized cases and cases of moderate severity before the onset of incapacitating manifestations. Severe cases tend to limit themselves under modern conditions because they present recognizable manifestations earlier and more definitely, and thus lead to prompt isolation before many persons have actually been exposed.

Smallpox virus yields readily to disinfectants and it appears to be less resistant to dessication than cowpox virus. Both are quickly

Digitized by Google Original from UNIVERSITY OF MICHIGAN

destroyed by the commonly used chemical disinfectants in solution strengths ordinarily employed and by heat. Weak solutions of phenol and the cresols can not be relied upon.

So long as the smallpox virus does not become an epidemic strain and undergo augmentation in its virulencies as a result of rapid passage through one infected person after another it does not tend to increase in severity from a mild form to a degree where it causes high case fatality rates and begins to spread regardless of everything but the presence of thoroughly immunized individuals. Smallpox after its introduction in Haiti among an unvaccinated population remained a mild disease in spite of the occurrence of a large number of cases. Here and there severe cases occurred and case fatality rates were moderately high in some localities, but for the most part it remained a mild disease. Of course the natives were vaccinated as promptly and numerously as possible. That measure naturally tended to check the rapidity of spread. Indeed, it is practically imposible to-day to study the spread of smallpox as left to nature to bring about immunization, for with the appearance of the disease general vacination is bound to be undertaken at least in groups around cases. Apart from the effect of vaccination, the climate was tropical. There was uniformly warm weather with an abundance of intense sunlight. The country had no means of transportation other than by foot or on mules or burros over long and narrow trails between communities. Most of the natives lived largely out of doors. Even in the cities where there was congestion and overcrowding most hours of the day were spent out of doors, and ventilation indoors was assured by the absence of glass windows and by cracks and open spaces due to lack of repair. The character of construction in general conformed to that commonly found in the Tropics. These conditions and circumstances tended in themselves to slow down the rate of transfer of the virus and helped to keep the virulence low within the area of transference from each new focus. Now and then some particularly susceptible individual developed a severe form of the disease and in some localities case fatality rates were higher than in other exposed groups of the population, but, in general, increased virulence was not sustained by continuous spread from the more dangerous foci.

It has often been noted in the United States that the disease does not tend to vary from the mild type prevalent from year to year in States regarded as unvaccinated. Of course, many persons are vaccinated in those States and every effort is made to detect new cases early. Although many cases are occurring, particularly in the winter and spring months, the disease is really prevalent in an endemic rather than epidemic sense. The number of cases resulting from each new focus of infection is limited to a few, one, or none. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

virus is not being passed rapidly and directly from one susceptible person to another. With the appearance of each new case a good many persons are vaccinated, first and last, in each exposure group. Often in spite of the activities of antivaccinationists a considerable proportion of the children will have been recently vaccinated. In communities where efforts to vaccinate have relaxed, a considerable proportion of young adults will still have considerable protection. During a recent outbreak of smallpox in New York State it was found that few of the children were vaccinated, but owing to the presence of persons of foreign birth as well as ex-service men a considerable percentage of the exposed adults were already well protected.

Smallpox gets a start often enough in the United States under conditions that favor progressive spread to indicate that it is liable to become a dangerous disease at any time. There are well informed epidemiologists who believe that the mild form of the disease commonly seen in the United States shows little or no tendency to change into a severe type. They do not claim that there is more than one kind of smallpox, but rather that strains tend to remain quite constant in disease-producing power whether little or great. Such a conclusion can readily be reached by studying the distribution of cases and the epidemic characteristics of the disease in the United States, England, Scotland, and also in Germany where smallpox has prevailed in severe form in recent years. Such a conclusion does not seem to be justified when due allowance is made for the many epidemiological factors which, acting together, contribute to the resultant epidemicity, but which can not be weighed separately. At any rate there is general agreement among qualified observers that such terms as alastrim, Kaffir milkpox, and amaas should not be used because the disease described under each of these names is in fact smallpox, however mild and atypical the cases.

Park has crystallized the ideas resolving from his extensive studies of communicable diseases into the useful statement. "The severity of an outbreak of a communicable disease will be determined by the relative susceptibility of the individuals making up a population, the type of virulence and the degree of virulence of the microbe, the degree of exposure and the health and living conditions of the people." In addition to his own observations Park considers Topley's experimental work wherein he caused and studied the development of epidemics among groups of white mice, using a microorganism that causes an intestinal disease in nonimmune mice. For an epidemic to occur it was found that the majority of the mice in a colony must be susceptible or if not that the bacteria used must have great invasive virulence. When survivors of a previous outbreak were added to a new group of susceptible mice in which an epidemic was started, some of the immunized mice also succumbed. (Similar

Digitized by Google Original from UNIVERSITY OF MICHIGAN

consequences were observed during influenza epidemics in 1918 and 1919).

From these studies of mice and epidemiological studies of diphtheria and influenza it seems probable that the invasive and disease producing powers of the causative agents of epidemic diseases are continually decreasing or increasing, depending upon the resultant of all epidemiological forces bearing upon each new case in turn. As Frost has pointed out the entire incidence of the disease simply represents the manifestations of the biological reaction that is taking place between the living microorganisms and the population.

It seems as though microorganisms transferred during the active stages of a disease are more capable of causing infection and of causing serious infection than those transferred during convalescence or before the onset of clinical symptoms. Of course, the relative susceptibility of exposed persons is also an ever present factor. More important in effecting decrease in virulence than the establishment of convalescence in the instant case is the number of transfers away from an actual case. As Park puts it, the further the carrier is from a case of the disease the less virulent the microbes. Even then if resistance is low the disease may occur. When susceptible mice were exposed to convalescent carriers and then placed in contact with a second group of susceptibles for a brief time early in the incubation period but long enough to transfer the microorganisms, and the second group was similarly placed in brief contact with a third group, and the third with a fourth and so on, all of the second group, which had been in contact with carriers directly from an actual case, took the disease and died. Only two out of five in the third group became infected, and none in the fourth and later groups. Presumably the mice were all susceptible, but the microorganisms had lost their invasive power.

Smallpox, influenza, measles, pneumonic plague, and to a lesser degree diphtheria, have much in common from an epidemiological standpoint. Subject to individual immunological differences they probably follow certain natural laws that apply to diseases which are spread by direct or immediate indirect contact and have their permanent reservoirs of infection in the human body. Plague, of course, has a reservoir in human beings only so long as it continues to spread as pneumonic plague.

Frost has in a very useful manner summarized the conditions and circumstances involved. With due credit but without undertaking to quote him exactly or pin responsibility upon him for any statement made here, it may be said that the factors making for the development and spread of an epidemic can be summarized as follows:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

1. Sources of infection present and the rate of change of those sources in the population groups concerned.

2. Exposure, or rate of change in the numbers of individuals exposed to new foci of infection, as determined by all social, occupational, and environmental influences that have a bearing on transfer of the virus.

3. The virus; rate of change in virulencies.

4. Exposed individuals; rate of change in relative susceptibility; different degrees of immunity and porportionate numbers of individuals representing each degree.

By thus grouping the relevant conditions and circumstances which are so numerous, complex, and mutually effective that complete analysis and separate study of any one factor leads nowhere, it becomes possible to make a partial analysis that will serve practical purposes in systematizing and comparing the findings of epidemiological studies. No matter what the belief held with regard to the third group, all will agree that the other three are variables during the course of any epidemic or endemic period. Accepting all four as variables we are led to a much more adequate explanation of the behavior of smallpox and can account for the fact that severe cases appear in series now and then during the course of mild epidemics as well as for the fact that it remains a mild disease in some parts of the world year after year while elsewhere severe types are the rule. It should not be forgotten that where severe cases are occurring mild and unrecognized cases are also occurring.

It may seem paradoxical but there appears to be a tendency for smallpox to remain prevalent and mild in a poorly vaccinated population whereas the disease is usually severe in type when it appears in a well vaccinated state. Antivaccinationists have sought to make much of this. The truth is that the vaccination status of the population in a so-called well vaccinated state is not good enough to prevent a certain amount of spread when a virulent focus of infection is introduced. Vaccination is not repeated often enough after early school years to insure protection in age groups beyond adolescence and early adult years. The situation would be different if the general population, like the personnel of the Navy, has been repeatedly vaccinated and tested for immunity from time to time in all age groups.

On the other hand, the disease continues to be endemic or mildly epidemic in poorly vaccinated states because of the number of susceptibles in the population available to receive and pass the virus on. The disease remains mild, with the exception of isolated severe cases here and there, because a good many individuals have had the disease or have been vaccinated; because neighboring states and the activities of the Federal Government afford the population in

Digitized by Google Original from UNIVERSITY OF MICHIGAN

question a considerable measure of protection against the introduction of virulent foci; because sanitary and social barriers protect many susceptibles from exposure so long as the disease remains mild in type, and because with early isolation and other indicated public health measures fewer persons are exposed to the severe cases.

There have been enough exceptions to the general rule in this country, it would seem, to prove that smallpox can become a very dangerous disease in a comparatively short time after an epidemic has begun. During the epidemic which occurred in Boston and vicinity in 1901 the early cases were mild and discreet, but within a few weeks confluent cases were seen more frequently, and after that hemorrhagic cases were relatively more numerous until the epidemic was brought quite suddenly to an end by intensive vaccination and the quarantine measures which were employed.

CONCLUSION.

Naval personnel are liable to be exposed to a virulent focus of the disease abroad, especially in the Orient and eastern Europe. Even under those circumstances the danger is little or nothing to men who have been vaccinated repeatedly in previous years and have given immunity reactions from time to time, provided immunity has been stimulated recently by revaccination. An occasional case of smallpox may occur in spite of recent revaccination but the disease will not spread if the other members of the crew have been properly immunized. Capt. C. E. Riggs, Medical Corps, United States Navy. reported three cases following exposure to a virulent Chinese strain of smallpox in men who had been vaccinated within a year. Leake mentions a case in which smallpox was acquired by exposure during a mild epidemic although the victim had three good recent scars of vaccina and had been revaccinated within four weeks. His conclusion is, nevertheless, that recent successful vaccination with a *potent* virus is a certain protection in case of subsequent exposure to smallpox in nearly every instance. The expression, successful vaccination in this sense includes the reaction of immunity, all forms of accelerated reactions, and the primary take.

MEDICAL OFFICER RECOMMENDS ADOPTION OF A REGISTER FOR COWPOX VACCINATIONS.

The following letter addressed to the bureau by Lieut. J. H. Harris, Medical Corps, United States Navy, sets forth his ideas relating to the advisability of recording the results of cowpox vaccination in a special register to be kept for that purpose:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"There is forwarded herewith two enclosures, one of which is designated 'Right-hand page,' and the other, 'Left-hand page.' These are self-explanatory and are intended as sample loose leaves to be inserted in sufficient numbers in an appropriate binder which, it is recommended should be designated 'General Register of Cowpox Vaccinations.'

"It is believed that if this register is adopted by the Bureau of Medicine and Surgery and issued to the Medical Department of the service as a loose-leaf affair with appropriate binder, more consistent continuous and satisfactory efforts would be made by all medical officers and hospital corpsmen on independent duty toward properly protecting all personnel against smallpox by cowpox vaccination.

"Furthermore the 'General Register of Cowpox Vaccinations' would prove of invaluable aid in preparing the table of data required in connection with cowpox vaccinations for the annual sanitary report as set forth in Table No. 2, Article 2698, Manual of the Medical Department, United States Navy, 1922.

"In case the health record of any member of the personnel of the Navy or Marine Corps became lost or misplaced, reference to the 'General Register of Cowpox Vaccinations,' on file at the last place of duty would supply the required important information as to protection against smallpox. If a ship is placed out of commision or a station closed, the 'General Register of Cowpox Vaccinations' should be forward to the Bureau of Medicine and Surgery.

"The undersigned is of the opinion that the 'General Register of Cowpox Vaccinations" would prove of great assistance to an inspecting officer from the Bureau of Medicine and Surgery, as it would afford a readily available and comprehensive survey of cowpox vaccinations and the results at a given naval or marine activity for any period of time.

"The undersigned inaugurated the above discussion system of recording cowpox vaccinations and results while attached to the receiving ship at Hampton Roads, Va., during the year 1920, and consequently had on file the necessary data relative to cowpox vaccinations to be inserted as a table in the annual sanitary report as required by 'Notes on Preventive Medicine for Medical Officers,' dated November 15, 1921, and naturally felt keenly gratified at having successfully anticipated a new requirement by the bureau. Commander H. A. May (MC), United States Navy, senior medical officer, United States naval training station, Hampton Roads, Va., at the time, informed the writer in January, 1922, while discussing the new requirements in connection with the annual sanitary report, that in all probability the Medical Department of the receiving ship at Hampton Roads, Va., was the only activity which had tabulated the required data in connection with cowpox vaccinations for the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

annual sanitary report for the year 1921, this data being recorded in the 'General Register of Cowpox Vaccinations.'

"It is requested that this letter and enclosures, after being considered by the bureau, be referred to the officer in charge of the publication of the UNITED STATES NAVAL MEDICAL BULLETIN, with a view to having them published in an early issue of the BULLETIN if considered acceptable. It is suggested that facsimiles be made of enclosures in order to properly illustrate the article.

"In the event that the bureau approves the above discussed system of recording cowpox vaccinations it is recommended that the 'General Register of Cowpox Vaccinations' be constructed along lines similar to binder No. 74936, manufactured by the Graham-Chisholm Co., No. 9–15 Murray Street, New York City.

"By publishing the above account of and recommendation in case of the 'General Register of Cowpox Vaccination,' with facsimiles of the loose leaves as inclosed, in an early issue of the UNITED STATES NAVAL MEDICAL BULLETIN, medical officers would have an opportunity to make a 'General Register of Cowpox Vaccinations' out of an ordinary blank book and have it in use throughout the service until such time as the bureau saw fit to issue the binder and loose leaves to the medical department of each naval and marine activity.

"In connection with the campaign relative to vaccination against smallpox in the Navy waged by the Bureau of Medicine and Surgery during the past few years in 'Notes on Preventive Medicine for Medical Officers, United States Navy,' the undersigned is of the opinion that the adoption by the bureau of the 'General Register of Cowpox Vaccinations' as a standard medical department form would prove most instrumental and of great assistance in the solution of the ever-present and difficult problem of insuring the Navy against smallpox by constant, consistent, and thorough checking up of the vaccination status of each member of the personnel, as a matter of routine, and in such a systematized manner that omissions and mistakes could not occur."

[Left-hand page.]

Month of October, 1923.

Number.	Name (in full).	Rank or rate.	Date vaccinated.	Number prior vaccination scars.
.....				
.....				
.....				
.....				
.....				
.....				

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

[Right-hand page.]

Month of October, 1923.

RESULT OF VACCINATION.

Primary reaction.	Accelerated reaction.	Reaction of immunity.	Failure.	Date of result.	Entered in health record (date).

Comment.—The bureau does not, in general, recommend the use of a book for the purpose of recording the results of vaccination, but is glad to receive suggestions from medical officers and to publish constructive ideas.

The important thing is to record the result of vaccination in the man's health record at the time the reading is made. If a book or typewritten sheet is customarily used for first recording results and these are later transcribed at the same time in a number of health records an unnecessary risk of making errors in the coyping is introduced. On board ship the health record is available and the entry can be made at once. Ashore, circumstances alter cases. If the health record is not available at the time the reading is made, a card system like that which came into use on board ship to fill a definite need, and is now in general use in all fleets, would seem to be preferable to a book. The card takes care of all data that must be determined before the health record is complete to date. Entries for typhoid prophylaxis are just as important as those for cowpox. The cards also serve as an index for health records received.

Where men must be seen away from the Medical Department office any form of memoranda will suffice for recording data until they can be transferred to health records and cards.

REPORT OF A CASE OF CEREBROSPINAL FEVER AT THE UNITED STATES NAVAL TRAINING STATION, NEWPORT, R. I.

A case of cerebrospinal meningitis occurred at this station on December 1, 1923. The case presented characteristic symptoms; viz., hyperpyrexia (F. 105°), mental dullness and confusion, severe headache, marked prostration, rigidity of the neck muscles, and a typical rash on trunk and limbs. Pupils were equally contracted.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The onset was misleading in character. The patient first reported at 8 a. m. complaining of slight headache and general malaise. Low fever was present but prostration, rash, mental symptoms, and rigidty of neck muscles were absent. The case became suddenly severe at 11.30 a. m. and was diagnosed clinically as meningitis. Transfer to the naval hospital, Newport, R. I., was effected at 12 noon, the hospital first having been notified of the nature of the case. A lumbar puncture was done shortly after admission and 15 cubic centimeters of antimeningococcus serum was introduced into the spinal canal. The spinal fluid withdrawn was clear under increased pressure and showed cellular increase. The fluid was negative for the meningococcus.

On December 2, 1923, the man's condition was improved. Fever had fallen to 102° F. Lumbar puncture was repeated, antimeningococcus serum administered, and the meningococcus was found to be present in the spinal fluid.

All contacts were placed in quarantine in a unit of barracks "A" under constant supervision of the Medical Department. Sanitary recommendations were submitted, approved, and executed. Cultures were taken from the nasopharyngeal secretions of all contacts on December 4, 1923.

The latest reports state that this case is continuing to do well and that serum treatment is being continued.

There has been no further development of this disease among the contacts thus far, and the case is believed to be sporadic, as were its forerunners, which occurred during the early months of the year.

MEDICAL BULLETIN OF THE DESTROYER SQUADRONS OF THE BATTLE FLEET—PROPHYLAXIS OF VENEREAL DISEASES.

The bureau was much impressed by the completeness and concise arrangement of the bulletin, printed on board the U. S. S. *Melville* and published for the information of destroyer squadrons for the quarter ended September 30, 1923.

Limited to one sheet it contains a surprising amount of information and compares favorably with many city health department bulletins which find their way to the division of preventive medicine in the bureau. The bulletin is instructive and must serve to increase the effectiveness of health measures and medical department activities in the destroyer squadrons.

The bulletin contains a complete table of vital statistics, ingeniously arranged so that annual rates for the quarter are available at the foot of each column for direct comparison with yearly and monthly rates compiled by the bureau for various organizations and the Navy in its entirety.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

In a paragraph devoted to the control of venereal diseases, the bureau is glad to see stress laid on the point that prophylactic tubes intended for self-administered disinfection are not intended to supplant standard Navy prophylaxis. There is much evidence that while some men appreciate the danger of infection and can be depended upon to apply disinfectants as promptly as possible after exposure, many will not do so. It is probable that more cases of disease will be prevented, in the long run, by prophylaxis on board ship in spite of the delay. Many cases that could have been prevented will probably continue to occur unless all men who have exposed themselves are required to report exposure immediately upon their return from liberty, subject to punishment for failure to obey a ship or force order to that effect if venereal disease subsequently develops without record of prophylaxis. Commanding officers have jurisdiction as noted in the NAVAL MEDICAL BULLETIN for August, 1923. Prophylactic tubes should also serve usefully to reduce the time elapsing before disinfection, and they should, of course, be supplied when there is any likelihood that they will be used. It is doubtful whether they will be used when instead of being issued upon request they are forced upon the men. When properly used, the tubes are probably quite as effective as the prophylactic agents used on board. It is hoped that medical officers will adequately discuss their observations and conclusions regarding prophylaxis in their forthcoming annual sanitary reports.

BACILLARY DYSENTERY IN GUAM.

The following telegram was received from the commanding officer of the naval station, Guam, December 19, 1923.

Bacillary dysentery, flexner strain, prevalent. Have been 150 known cases and many unreported cases in Agana and Sumay since November 5. Nine deaths occurred in hospital and 31 in native hospital. Nine cases occurred among white service personnel and families and 5 among native seamen with no deaths.

PORTABLE CANVAS SACK STEAM DISINFECTORS AVAILABLE.

The Bureau of Construction and Repair announced by circular letter, November 28, 1923, that the canvas sack portable steam disinfector previously recommended by the Bureau of Medicine and Surgery for vessels not equipped with steam disinfectors of a permanent type may now be obtained from the New York yard. Commanding officers of naval transports, light cruisers, gunboats, and fuel and cargo vessels attached to the train are invited to submit requisitions, for one disinfector each, chargeable to the vessel's allotment under General Order No. 109.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

HEALTH OF THE NAVY.

This report covers the month of January, 1924. So far as reports which have reached the bureau indicate, health conditions have been as satisfactory as could be expected in midwinter. With the exception of 43 cases of measles at the naval training station, Hampton Roads, Va., a few at San Diego, Calif., and increased prevalence of malaria among marines in Haiti, there were no outbreaks of important communicable diseases. Only 234 cases of influenza were notified, an increase of but 6 over the figure for the preceding month, making an admission rate of 23.5 per 1,000 per annum for the month as compared with 140.4, the five-year median rate for the month of January. The cases that occurred were quite evenly distributed among the personnel ashore and afloat. No real outbreak occurred.

The January admission rate for common diseases of the respiratory type—acute tonsillitis, bronchitis, and common colds—was 129 per 1,000 per annum. This figure is practically the same as the median January rate for the preceding five years, 126.

Forty-four cases of pneumonia were reported as compared with 23 cases in December, making an admission rate of 4.4 in comparison with the five-year median January rate of 7.0 per 1,000 per annum.

Admissions to the sick list for all causes were not as numerous as might be expected in January, the rate being 640 per 1,000 per annum. The five-year median rate for the corresponding month is 833. The admission rate for accidental injuries and poisoning was comparatively low—55.4 per 1,000 per annum. The median January rate for the last five years is 66.31.

Up to this time 159 Form F cards have been received for January cases. Of these, 83.6 per cent occurred within naval commands, whether or not connected with the performance of work of prescribed duties, while 16.4 per cent were for injuries and poisonings that happened while the men were on leave or liberty. Of the cases that occurred within the command, 68.4 per cent were incidental to the performance of work or prescribed duties and 31.6 per cent were not so related. Of all admissions for injuries and poisonings recorded during the month, 57.2 per cent were incurred in carrying on the essential work of the Navy in contradistinction to those connected with athletics or personal affairs within a station or ship, and also those resulting from conditions encountered while on liberty.

The following table shows rates per 1,000 per anum for the principal communicable diseases, January, 1924. For comparison, corresponding median rates are given for the same month, years 1919 to 1923, inclusive:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

	January, 1919–1923.	January, 1924.
Cerebrospinal fever	0.38	0
Diphtheria	2.25	.50
German measles	.38	1.41
Influenza	140.40	23.52
Malaria	12.84	17.09
Measles	12.04	19.30
Mumps	17.68	10.45
Pneumonia	6.99	4.42
Scarlet fever	3.20	1.81
Smallpox	.19	0
Tuberculosis	4.43	2.91
Typhoid fever	.10	.10

VITAL STATISTICS.

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$ or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

E. R. STITT.

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of January, 1924.*

	Forces afloat.	Forces ashore.	Entire Navy.	Marine Corps.
Average strength	78,903	40,491	119,394	21,438
All causes:				
Number of admissions	2,889	3,715	6,604	1,447
Annual rate per 1,000	439.36	1,100.98	663.71	877.45
Disease only:				
Number of admissions	2,631	3,422	6,053	1,317
Annual rate per 1,000	400.12	1,014.14	608.33	798.62
Communicable diseases, exclusive of venereal disease:				
Number of admissions	933	1,262	2,195	390
Annual rate per 1,000	143.54	388.95	220.61	136.49
Venereal disease:				
Number of admissions	850	529	1,379	267
Annual rate per 1,000	129.27	156.77	138.59	161.91
Injuries and poisons:				
Number of admissions	258	293	551	130
Annual rate per 1,000	39.24	86.83	55.38	78.83

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates, etc.*—Continued.

	Per cent Jan. 6, to Feb. 2, 1924.		Per cent since July 1, 1923.	
All naval districts in the United States	84.00	7.33	79.91	9.47
First naval district	82.35	0	81.54	13.07
Third naval district	100.00	0	73.75	12.50
Fourth naval district	88.89	11.11	75.61	12.20
Fifth naval district	79.25	11.32	76.17	10.36
Sixth naval district	84.61	0	75.95	5.06
Seventh naval district	0	0	0	0
Eighth naval district	100.00	0	86.67	0
Ninth naval district	90.90	9.10	87.93	6.90
Eleventh naval district	76.47	11.76	81.08	10.81
Twelfth naval district	92.86	7.14	84.85	8.08
Thirteenth naval district	75.00	0	94.23	3.84

TABLE No. 4.—*Number of admissions reported by Form F cards, and annual rates per 1,000, entire Navy, for the four-week period January 6 to February 2, 1924, inclusive.*

	Navy (strength, 97,956).		Marine Corps (strengh, 21,438).		Total (strength, 119, 394).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases of blood	1	0.13	1	0.61	2	0.22
Diseases of circulatory	44	5.84	18	10.92	62	6.75
Diseases of digestive system	341	45.25	137	83.08	478	52.04
Diseases of ductless glands and spleen	1	.13	2	1.21	3	.33
Diseases of ear, nose, and throat	317	42.07	75	45.48	392	42.68
Diseases of eye and adnexa	51	6.77	23	13.95	74	8.06
Diseases of genito-urinary system (non-venereal)	90	11.94	27	16.37	117	12.74
Communicable diseases transmissible by oral and nasal discharges	(A) 362 (B) 860	48.04 114.13	79	47.90	441	48.02
			133	80.65	993	108.12
Communicable diseases transmissible by intestinal discharges	10	1.33	2	1.21	12	1.31
Communicable diseases transmissible by insects and other arthropods	38	5.04	175	106.12	213	23.19
Tuberculosis (all forms)	24	3.19	1	.61	25	2.72
Venereal diseases	900	119.44	267	161.91	1,167	127.06
Other diseases of infective type	170	22.56	75	45.48	245	26.68
Diseases of lymphatic system	32	4.25	16	9.70	48	5.23
Diseases of mind	27	3.58	16	9.70	43	4.68
Diseases of motor system	80	10.62	30	18.19	110	11.98
Diseases of nervous system	40	5.31	14	8.49	54	5.88
Diseases of respiratory system	353	46.85	135	81.86	488	53.13
Diseases of skin, hair, and nails	57	7.56	33	20.01	90	9.80
Herniae	38	5.04	9	5.46	47	5.12
Miscellaneous diseases and conditions	115	15.26	28	16.98	143	15.57
Parasites (fungi and certain animal parasites)	99	13.14	19	11.52	118	12.85
Tumors	7	.93	1	.61	8	.87
Female diseases and conditions	1	.13	0	0	1	.11
Injuries	358	47.51	117	70.95	475	51.72
Poisonings	13	1.73	13	7 88	26	2.83
Dental diseases and conditions	8	1.06	1	.61	9	.98
Total	4,437	588.83	1,447	877.45	5,884	640.65

TABLE No. 5.—*Deaths reported, entire Navy, for the four-week period, January 6 to February 2, 1924, inclusive.*

	Navy (strength, 97,956).	Marine Corps (strength, 21,438).	Total (strength, 119,394).
Meningitis, cerebrospinal	1	0	1
Pneumonia, lobar	1	1	2
Tuberculosis:			
Chronic pulmonary	4	0	4
Acute general	1	0	1
Typhoid fever	1	0	1
Other diseases	6	0	6
Drowning	4	0	4
Other accidents and injuries	14	3	17
Poisonings	4	0	4
Total	36	4	40
Annual death rate per 1,000, all causes	4.78	2.43	4.36
Annual death rate per 1,000, disease only	1.86	.61	1.63

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

MAY 13 1924

VOL. XX NO. 4

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

APRIL, 1924

(MONTHLY)

Compiled and published under authority of Naval Appropriation Act for 1924, approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

TABLE OF CONTENTS.

Page.

PREFACE v

NOTICE TO SERVICE CONTRIBUTORS vi

SPECIAL ARTICLES:

ELECTROCARDIOGRAPH IN PROGNOSIS, VALUE OF.
By Lieut. Commander W. A. Bloedorn and Lieut. L. J. Roberts, Medical Corps, United States Navy 423

ETHYLENE FOR GENERAL ANESTHESIA, USE OF.
By Commander C. W. Moots, Medical Corps, United States Naval Reserve Force 429

HYDRONEPHROSIS.
By Lieut. Commander R. Cuthbertson, Medical Corps, United States Navy 431

UNSUSPECTED SYPHILIS.
By Lieut. Commander W. H. Connor, Medical Corps, United States Navy 439

RISE OF LOCAL ANESTHESIA.
By Dr. Charles A. Ingraham 445

CLINICAL NOTES:

SARCOMA.
By Lieut. R. M. Choisser, Medical Corps, United States Navy 451

AVULSION OF SCROTUM, LEFT TESTICAL AND SHEATH OF PENIS.
By Lieut. Commander G. F. Cottle, Medical Corps, United States Navy 457

HYDATIDIFORM MOLE, CASE OF.
By Lieut. Commander C. C. Kress and Lieut. H. C. Bishop, jr., Medical Corps, United States Navy 460

NOTES AND COMMENTS:

Mental tests for recruits—Fish poisons—An eighteenth century country practice—Medical expedition to the South Seas—How to use a refrigerator—Anaphylactic reaction from typhoid prophylaxis 463

NAVY NURSE CORPS:

Relation of the dietetic department to the medical service of a hospital 477

BOOK NOTICES 483

PREVENTIVE MEDICINE, STATISTICS:

The prevention and control of cerebrospinal fever in the British Army as reviewed in the official history of the war 493

Comments relating to health conditions, from the annual report of the commander of the United States naval detachment in Turkish waters—Toxic effect of hydrogen sulphide—Eradication of ants from ships of the United Fruit Co.—Physical examination of food handlers in New York City—Venereal diseases and prophylaxis in the United States Asiatic Fleet—Typhoid fever report—Dysentery and the tendency to report ill-defined cases under a dysentery title—Remarks relating to the use of nomenclature titles 515

TABLE OF CONTENTS.

PREFACE.

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles, but still more so in reviews.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX. APRIL, 1924. No. 4

SPECIAL ARTICLES.

THE VALUE OF THE ELECTROCARDIOGRAPH IN PROGNOSIS.[1]

By W. A. BLOEDORN, Lieutenant Commander, and L. J. ROBERTS, Lieutenant Medical Corps, United States Navy.

The electrocardiograph has definitely established itself as an invaluable aid in the diagnosis of the arrhythmias. In this respect, it is universally admitted that it is superior to the polygraph. As a rule, electrocardiographic tracings give us a clear-cut picture of the mechanism of the heart, the spread of the excitation wave and the presence or absence of an abnormal rhythm.

The additional data made available through electrocardiographic studies can be applied clinically with great advantage to both the patient and the physician. With this additional knowledge that the electrocardiograph has placed in the hands of the physician, he is able in most instances to make the correct diagnosis of an arrhythmia by physical examination alone. Nevertheless, when any question arises regarding the precise mechanism of the heart, the electrocardiograph becomes the court of last resort.

Within the last few years, as the result of innumerable tracings and the researches of many investigators, the electrocardiograph has come to be regarded as having some additional value to the clinician in the way of prognosis. As prognosis constitutes one of the most important aspects of a cardiac case, any measure which may throw additional light on this vital matter should be utilized as a routine procedure.

We are able with a fair degree of certainty to diagnose by clinical means the state of the various valves of the heart. The condition of the conduction system of the heart at any given time can be determined by the electrocardiographic tracing. But even knowing the state of the valves and of the conduction system, we are still left more or less in the dark as regards the condition of the cardiac muscle itself, which, after all, is probably most important in the vast majority of cardiac cases.

[1] Reprinted from the Archives of Internal Medicine for November, 1923.

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

We have attempted to devise functional tests which will give us information regarding the state of the cardiac muscle. The great number of these tests proposed is in itself evidence that no test is entirely satisfactory. Each of the various tests devised depends for its result not only on the integrity of the heart muscle but also on the nervous mechanism, the respiratory apparatus, the state of the blood and, in fact, on such a great variety of bodily activities that the condition of the heart ieself may be entirely obscured and gravely erroneous conclusions reached.

Since the advent of the electrocardiograph, attempts have been made to correlate the findings of abnormal deflections in electrocardiographic tracings with definite pathologic conditions of the heart muscle. While data on this particular point are still in the process of being formulated, we may safely say that certain of these abnormal deflections are coming to be regarded more and more as indicative of myocardial damage.

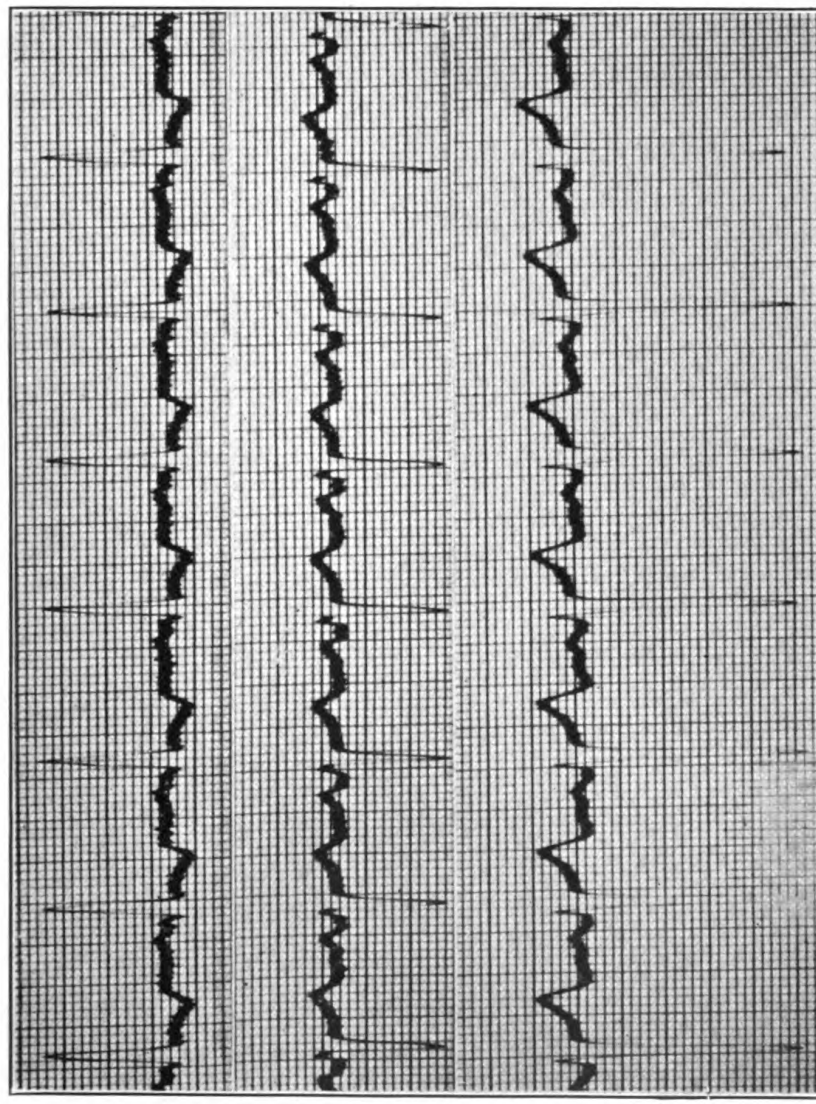
The two groups of deflections which have been particularly regarded with significance are the Q R S group and the T-waves.

The Q R S group normally should not exceed one-tenth of a second in duration, and in a tracing that shows a longer duration we are justified in assuming that there is defective conduction through one or the other ventricle. Again, a notching of the Q R S group in leads other than Lead III has come to be regarded as additional evidence of myocardial damage. Occasionally we find this abnormal width of the Q R S group associated with a notching or slurring of the waves. The conduction system is regarded as specialized heart muscle, and constitutes only a small percentage of the total heart-muscle tissue. We know that it may be disturbed functionally without necessarily being organically damaged. In cases in which the conduction system shows this evidence of persistent impairment, it does not necessarily follow that the rest of the cardiac muscle is also impaired.

Nevertheless, in many cases, organic disease of the heart is an accompaniment of a defective conduction system. The heart may recover from widespread infection, leaving some residual scar tissue. If this should happen to be in some part of the conduction system, we may get rather startling electrocardiograms in an otherwise normal person. It would seem rather infrequent, however, for this relatively small area of the heart to be damaged without affecting other areas in the myocardium.

The other group of deflections which have come to be regarded as giving us some information concerning the state of the myocardium are the T-waves. Normally these waves are upright, although occasionally in Lead III we may find them inverted, and an inversion of the T-wave in Lead III is usually regarded as of no particular

Digitized by Google Original from UNIVERSITY OF MICHIGAN



424—1

FIG. 1.—T-WAVE IN LEAD I IS INVERTED, AND THERE IS SOME INCREASE IN THE Q-R-S INTERVAL. TIME IN FIFTHS AND TWENTY-FIFTHS OF A SECOND.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

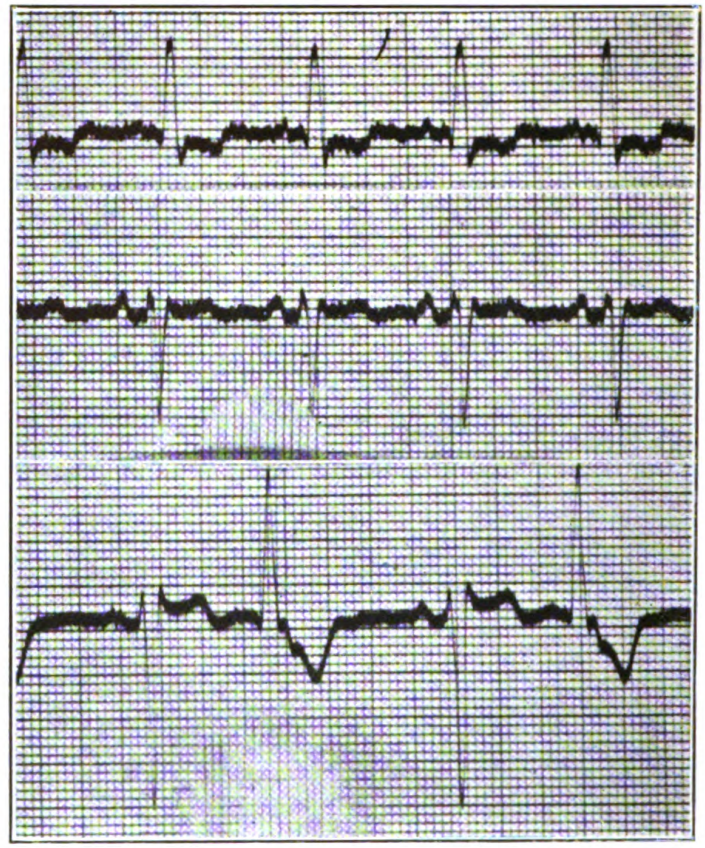


FIG. 2.—A BRIEF PERIOD OF EXTRA SYSTOLES ARISING IN THE RIGHT VENTRICLE. THE INVERSION OF THE T-WAVE IN LEAD I AND THE INCREASED Q-R-S INTERVAL PERSIST.

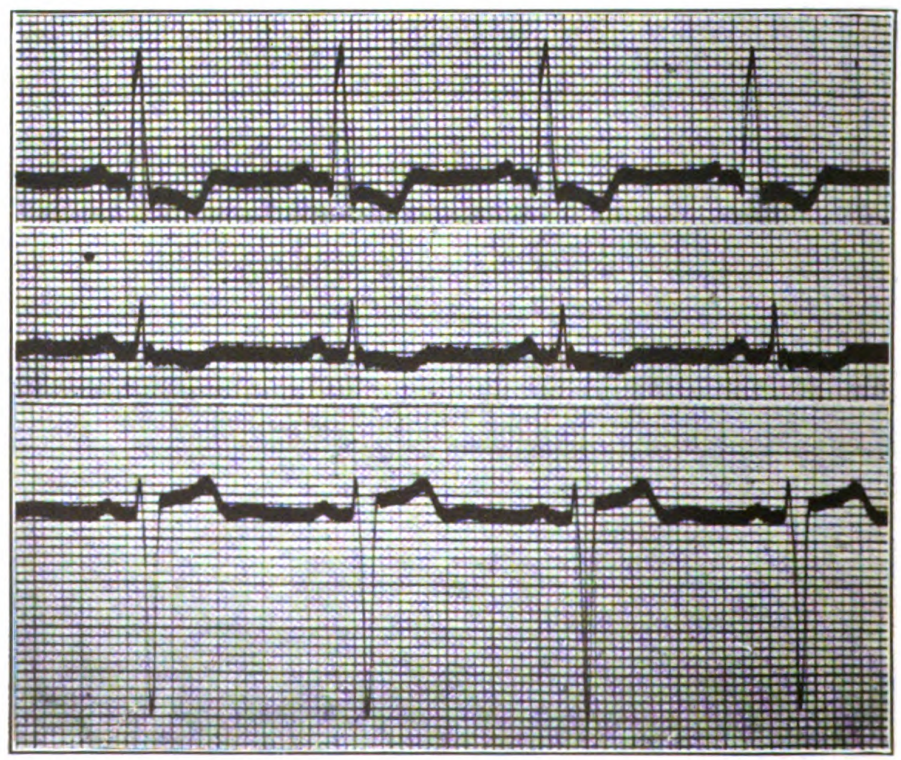


FIG. 3.—INVERSION OF THE T-WAVE IN LEADS I AND II. THE Q-R-S INTERVAL IS 0.12 SECOND. THE TRACING WAS TAKEN TEN DAYS BEFORE THE DEATH OF THE PATIENT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

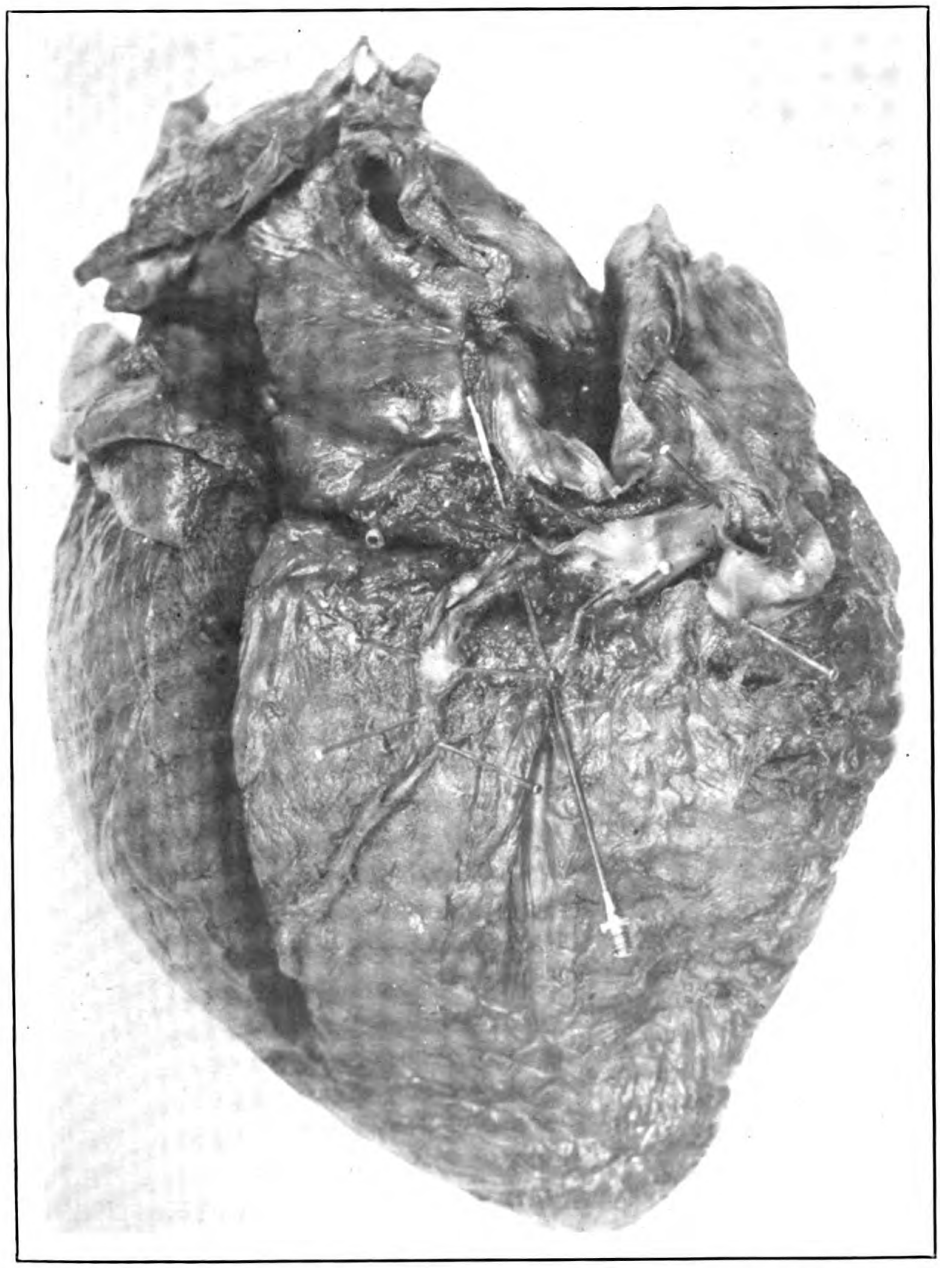


FIG. 4.—HEART SHOWING TORTUOUS AND SCLEROSED ANTERIOR CORONARY ARTERY. AT ONE POINT THE LUMEN WAS PRACTICALLY OCCLUDED BY A CALCAREOUS PLAQUE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

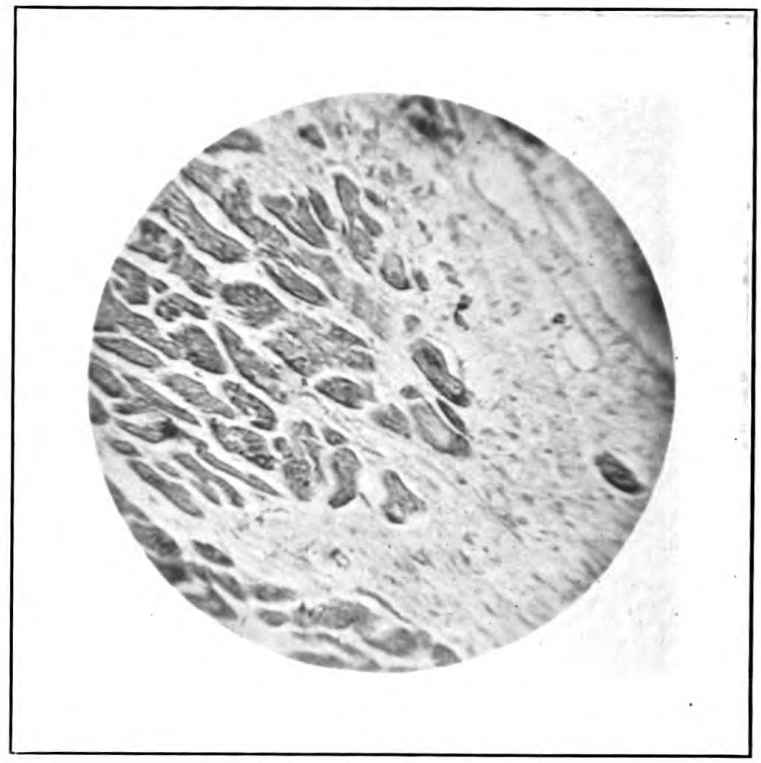


FIG. 5.—PHOTOMICROGRAPH OF A SECTION OF THE LEFT VENTRICLE BELOW THE POINT OF OCCLUSION OF THE ANTERIOR CORONARY ARTERY, SHOWING MARKED FIBROSIS AND REPLACEMENT OF MUSCLE CELLS BY CONNECTIVE TISSUE.

424—4

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

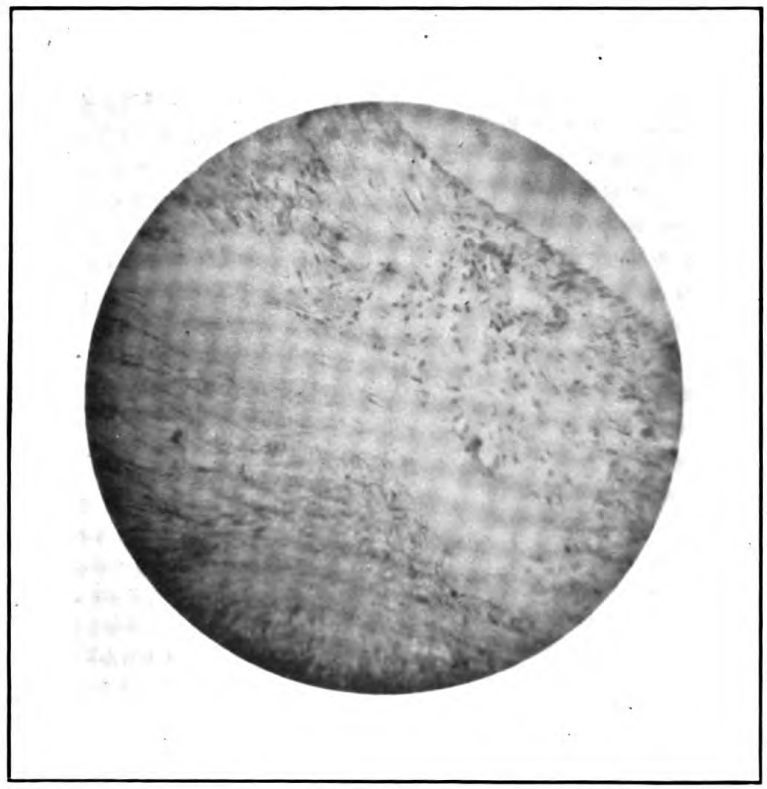


FIG. 6.—PHOTOMICROGRAPH OF THE ANTERIOR CORONARY ARTERY, SHOWING A MARKED CALCAREOUS DEPOSIT WITH THICKENING OF THE INTIMA AND WITH FIBROSIS

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

significance. However, an inversion of the T-wave in Lead I or II, or both, or in all three leads, can not be disregarded. The association of these abnormal deflections, in leads other than Lead III, with definite myocardial damage, has now been demonstrated sufficiently often to render their occurrence in a given case a rather bad omen.

It must be kept in mind, however, that the heart is able in many instances to recover from the effects of toxins or bacterial invasion and that one must exercise great care in invariably giving a bad prognosis, even when definite signs of myocardial injury can be demonstrated.

It is well known that the best cardiac drug in our possession, namely, digitalis, may produce significant changes in the electrocardiographic tracing, such as an inverted T-wave and a definite prolongation of the conduction time. Yet no one would go as far as to say that digitalis produces a myocarditis, and we see that when the drug is discontinued these changes in the tracing eventually disappear.

The same thing may be said of the acute infectious diseases. The heart may become involved during the course of these diseases and a definite myocarditis produced with significant changes in the electrocardiogram, and it is well for the cardiologist to exercise some self-restraint in giving his prognosis, even though it may be backed up by significant abnormalities in the electrocardiogram. It is not unusual for these abnormalities to disappear entirely as the patient recovers and the heart gradually regains its normal capacity. Nevertheless, these abnormalities occurring in any given case should serve to focus attention on the heart, and the patient in every instance should have careful supervision, adequate rest, and a routine tending to safeguard the heart until it has regained its normal functional capacity.

It is in cases in which these abnormalities in the electrocardiogram persist that we feel more at liberty in using the tracing for prognostic purposes. Their prognostic import becomes all the more significant in those cases in which the history of acute illness is absent or remote, and in which the symptoms of heart failure come on suddenly as in an anginal attack, or insidiously as in the common type of chronic myocarditis.

The lesions most frequently found associated with this abnormality of the electrocardiogram are probably hypertension, chronic myocarditis, arteriosclerosis, angina pectoris, hyperthyroidism, chronic nephritis, and disease of the coronary artery. The outstanding cardiac lesion in the majority of these cases is usually a fibrosis replacing and encroaching to some extent on the cardiac muscle.

A normal electrocardiogram, on the other hand, can never be regarded as indicating a perfectly healthy myocardium.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Pardee and Master state that ventricular muscle disease is a far more important deduction from the finding of abnormal ventricular waves than it has been heretofore considered, so that the clinical importance of abnormal electrocardiograms becomes more apparent.

Willius states that significant T-wave negativity and an abnormal Q R S complex in all derivations is of the greatest value from the standpoint of prognosis and justifies the use of the electrocardiograph as a valuable clinical adjunct.

Wilson states that when the T-wave is completely inverted in Lead I or II and the patient has had no digitalis, cardiac diseases may be diagnosed with a fair degree of certainty even when the Q R S group is normal.

As illustrating the type of patient to which we refer, a case is reported, with electrocardiograph tracings and postmortem findings.

REPORT OF A CASE.

History.—A man, aged 71, had been in excellent health until within a few months before examination. He complained of some shortness of breath on exercise, although not sufficient to incapacitate him to carry on his duties, which were largely of a supervisory character and involved little physical exertion.

Examination.—Physical examination revealed a rather marked tortuosity of the superficial arteries and the retinal arteries, which showed evidence of sclerosis. The blood pressure was: Systolic, 212; diastolic, 112. There was a blowing systolic murmur over the apex, and the aortic second sound was rather loud and ringing in character. Occasionally there was a reduplication of the second sound at the base.

The Wassermann reaction was negative; the urine showed albumin and granular casts and the blood showed a nonprotein nitrogen of 45 mg.

The electrocardiograph at this time showed a rapid rate which was quite regular. There was marked left side preponderance. The P R interval was normal. The P-waves were upright and normal in appearance in the three leads. The Q R S interval exceeded one-tenth of a second and could therefore be said to be definitely prolonged. The T-wave was inverted in Lead I. Figure 1 contains the electrocardiograms taken at this time. Eighteen days later the electrocardiogram showed no essential change from previous tracings except for a brief period of extrasystoles arising in the right ventricle and occurring at every other beat. Figure 2 contains these tracings. Two weeks after the second electrocardiogram was taken a third electrocardiogram showed that the resistance was 1,800 ohms; the rate 62 and regular; the P-wave upright

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and normal in the three leads; the P R interval 0.18 second; there was left side preponderance and notching of the S-wave in Lead II; the Q R S interval was 0.12 second; the T-waves were inverted in Leads I and II, upright in Lead III; following exercise the rate became 95 and one premature contraction arising in the auricle was seen, and after two minutes' rest the rate was 72. Figure 3 shows the tracings taken at this time.

Course of illness.—In view of these findings, together with the result of the physical examination, a grave prognosis was made. The patient, however, refused to remain in bed and went about his duties as usual. Ten days after the third electrocardiogram was taken, the patient died suddenly.

Necropsy.—The postmortem examination of the heart by Lieut. R. M. Choisser, Medical Corps, United States Navy, pathologist at the Naval Medical School, revealed that the heart was large (600 gm.) for the size of the person. The epicardial fat was yellowish and normal in amount. The superficial vessels were prominent and distinctly tortuous. The coronary arteries were sclerosed and noncompressible. Their outline was irregular because of the deposition of calcareous material. The anterior coronary artery when opened showed the lumen narrowed throughout by sclerosis and calcium deposits. In the descending branch, at a distance of 11 cm. from its origin, the lumen became distinctly narrow and was completely occluded by a large calcareous plaque. No gross lesions were demonstrable in the myocardium below this point. The lumen of the posterior coronary artery was also similarly narrowed throughout its course. It showed in its descending branch, 5 cm. from its origin, a definite narrowing, which amounted to almost an occlusion. The tricuspid valve measured 12 cm. The right ventricular wall was brownish and 11 cm. in thickness. The pulmonary artery showed a few areas of atheromatous changes, normal cusps and valve measurement of 6 cm. The left auricle was normal, with a wall measurement of 7 cm. The myocardium of the left ventricle was light brown with whitish areas of fibrous tissue throughout; it was markedly hypertrophied, being 2 cm. in thickness. The aorta showed atheromatous changes and plaques of calcium deposit. The valve measured 7 cm.

On microscopic examination of the coronary arteries, the media showed little change in structure, although its outline was irregular because of the protruding structures below. The intima was markedly thickened and irregular. Fibrosis was marked, and some areas showed an accumulation of small, round cells. A calcareous deposit was seen throughout. In the places in which extreme narrowing occurred, it appeared to be all that remained of the original coat.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The adventitia was thickened, consisting entirely of dense bands of fibrous connective tissue.

The myocardium of the auricles showed a degeneration of some of the muscle fibers and a slight amount of brownish pigmentation in the cytoplasm of the cells. Short bands of fibrous tissue lay between the muscle fibers and in places in which degeneration had taken place. The ventricles, especially the left, showed diffuse degenerative changes and marked fibrosis. In the region below the occlusion of the anterior coronary artery, the muscle cells appeared to be almost completely displaced by connective tissue. The cytoplasm of the remaining muscle cells showed a brown granular deposit. The vessel walls were quite thick and sclerosed throughout.

The diagnosis was arteriosclerosis of the coronary arteries with complete occlusion of the descending branch of the left anterior by calcareous plaques, 11 cm. from its origin; sclerosis of the right posterior with partial occlusion of the descending branch, 5 cm. from its origin; marked hypertrophy of the heart associated with chronic interstitial myocarditis and brown atrophy, and atheromatous changes in the pulmonary artery and bulbus aorta.

COMMENT.

It would appear, in view of the post-mortem findings in this case, that the inversion of the T-waves in Leads I and II and the widening of the Q R S group were the result of grave myocardial disease, and that their persistence justified one in giving a grave prognosis.

SUMMARY.

1. The ability of the clinician to diagnose valvular disease of the heart and lesions of the conductive system is well established.

2. If data can be obtained whereby we can more frequently detect myocardial damage, a more accurate prognosis can be made.

3. Evidence has been accumulating that electrocardiograms showing persistent straddling or splitting of the Q R S complex and inversion of the T-waves in Leads I and II are indicative of myocardial damage.

4. A case is reported in which electrocardiograms were obtained illustrating the presence of a prolonged Q R S complex, notching of the S-wave in Lead II and inversion of the T-wave in Leads I and II. A diagnosis of damaged myocardium was made and a bad prognosis given. Sudden death of the patient occurred within four months and post-mortem examination of the heart revealed chronic interstitial myocarditis and marked coronary sclerosis, with occlusion of the descending branch of the left anterior coronary artery.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

5. The association of the foregoing normalities of the electrocardiogram with definite myocardial and coronary damage, with resulting early death, appears to strengthen the belief that these findings justify a bad prognosis, particularly if they persist.

6. These abnormalities of the electrocardiogram are usually accompanied by other signs of a failing myocardium, but in certain cases may be the only evidence demonstrable.

THE USE OF ETHYLENE FOR GENERAL ANESTHESIA.

By C. W. Moors, Commander, Medical Corps, United States Naval Reserve Force.

During the past six months Dr. E. I. McKesson has administered ethylene for many of my abdominal sections in a manner similar to the technic used for gas-oxygen. Before describing our observations and comparisons, it is only fair to state at the onset that we have been accustomed to perform all major surgery under nitrous oxid-oxygen without ether for the past 14 years, with the exception of the year 1918, while I was serving as chief surgeon on the U. S. S. *Mercy*.

With our technic both as regards anesthesia and the handling of tissues, there is left little to be desired so far as anesthesia is concerned. However, we have made careful observations of the pulse, respiration, blood pressures, etc., in each case under ethylene and approached the study with open mind to discover, if possible, its position in relation to other anesthetics and its advantages or disadvantages. Thus far each patient has been anesthetized with gas-oxygen and enough of the operation performed under its influence to note the reaction of the pulse, blood pressures and respiration before substituting ethylene for the nitrous oxid. In this manner it has been easily compared both as regards relaxation and depression of those vital functions which we are able to measure or estimate.

Aside from the induction of anesthesia with nitrous oxid and oxygen, we have administered ethylene with the same apparatus (McKesson Model G, No. 100) and the same technic as worked out by Doctors Luckhart, Carter, and Herb of Chicago in their introduction of this new anesthetic. In order to make the change from nitrous oxid to ethylene or vice versa very easy, prompt and convenient, the ethylene tank and connections are attached to the apparatus with a two-way valve, so that by simply turning this valve either ethylene or nitrous oxid is available instantly.

In view of the fact that ethylene is an inflammable gas, we are convinced that it is safer to have a regulator for reducing the pressure, which will not be at any time employed for nitrous oxid or oxygen, as otherwise an explosion might possibly occur. After the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pressure has been reduced from 700 pounds to 40 pounds we believe such danger is no greater than with ether, which, however, is not free from dangers, as ether is not infrequently the cause of fires and explosions in the presence of cauteries, fulguration and other sources of ignition. We would, therefore, warn against the use of ethylene when sources of ignition are present in the operating room. Under such conditions pure gas-oxygen is the only safe anesthetic we have at present.

By test, ethylene was found by McKesson to be very soluble in oil but almost insoluble in water, which at once suggests that its action as an anesthetic probably is similar to ether and chloroform, and thus differing widely from nitrous oxid. It was not surprising, therefore, that ethylene shows evidence of cumulation necessitating "leaner" mixtures by from 5 to 10 per cent after anesthesia has progressed for 15 to 30 or 45 minutes.

Like other anesthetics there is considerable variation in the required dosage as well as the time required to secure relaxation, and not the same degree of anesthesia is secured in different subjects. So that, while it is not difficult to administer, one should carefully watch the patient for any signs, especially those pointing toward depression of the respiration or the circulation until more is learned of its action, peculiarities, and advantages.

In most of our cases, ethylene lowered the blood pressures as well as the pulse and respiratory rates as compared with the patient's previous reaction under nitrous oxid and oxygen. In others, however, the opposite effects were observed, but no cases of shock thus far have been encountered.

Ethylene produces an exaggerated pink color in the skin and rarely exhibits cyanosis with relatively low mixtures of oxygen. When there is a change in color, it is more of a dirty or ashy hue than the blue or purple seen with the extremely full blooded, red-faced individuals taking nitrous oxid.

No alarming symptoms have been seen in our cases, and while the odor is disagreeable to the operating room staff, and may be detected on the patient's breath for two or three days afterwards, the patient does not notice it and is not often nauseated nor vomits. In this respect it is apparently far superior to ether.

In most cases relaxation was very satisfactory under ethylene. Upon first opening the abdomen, the relaxation appears to be even more than is obtained by ether, but soon after abdominal manipulation the muscle seems to recover some tone. In two cases we were compelled to return to gas-oxygen to complete the operations as the relaxation was not sufficient.

Our preliminary observations seem to warrant the following conclusions:

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Disadvantages.—1. It is inflammable and should not be used with a cautery or electric spark in the same room.

2. The odor is garliclike and unpleasant, but not pungent or irrespirable as ether is in such concentrations.

3. Respiro-cardio-vascular depression is more than with gas-oxygen, but less than with ether.

Advantages.—1. Relaxation is generally quite satisfactory.

2. Anesthesia is quickly produced, almost as rapidly as gas-oxygen, but recovery is somewhat slower.

3. Nausea is less frequent than after ether.

4. It is not difficult to administer.

5. It promises an improvement over ether and may be an aid in gas-oxygen.

HYDRONEPHROSIS.

By R. CUTHBERTSON, Lieutenant Commander, Medical Corps, United States Navy.

Hydronephrosis is a condition produced by an obstruction to the normal outflow of urine from the renal pelvis by causes operating either inside or outside the genito-urinary tract. The retained fluid is uninfected, usually transparent, pale in color, and has a low urea content, and low specific gravity. It may be tinged with blood and tissue detritus. If it becomes infected the condition of pyonephrosis supervenes.

There are all degrees of hydronephrosis from incipient to advanced with symptoms corresponding to the state present. A moderate degree of hydronephrosis has been carried for years without symptoms. Acute and advanced cases present definite clinical symptoms which will be discussed later.

Normally the urine from the kidney is poured by the funnel-shaped pelvis into the ureter without any retention. However, if an obstruction, partial or complete, occurs in the course of the urinary tract either inside or outside, then the resulting back pressure of urine gradually or suddenly, depending upon the degree of obstruction, changes the function of the renal pelvis from a collecting to a storage receptacle and distension occurs. A certain amount of resistance to outflow of urine can be overcome by the kidney. If it becomes excessive distension of the renal pelvis results and lasts as long as the obstruction exists.

Etiology.—Intrinsic causes of obstruction may be classified as follows:

Those affecting the kidney pelvis—Tumors, calculi, blood clots.

Those affecting the ureter—Calculi, blood clots, tumor, urethritis, stricture, structural defects—Valves, angulations.

Those affecting the bladder—Calculi, tumors, prostatic enlargement—Malignant, benign.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Those affecting the urethra—Urethral stricture, calculi, malformations, tumors.

Extrinsic causes.—Pressure of abdominal neoplasm, ptosis of kidney, anomalous arteries of kidney crossing ureter near kidney pelvis, adhesion bands kinking ureter, inflammatory deposits along the ureter, pressure from large accumulations of fluid in the abdominal cavity, tumors of the bladder, uterus, the rectum, the prostate; ovarian cysts, tuberculous glands, visceroptosis, retroflexion of the uterus, etc.

It is easily seen that a wide field of investigation is opened up in the consideration of the various possible causes of obstruction to urinary outflow. From a surgical standpoint hydronephrosis is a unilateral renal expansion caused by some obstruction at the ureteropelvic junction or along the course of the ureter to the bladder.

In obstruction to urinary outflow due to causes operating in the lower part of the genito-urinary tract, the bladder largely compensates for the increased resistance, and distension of the renal pelvis is of slight or moderate degree except in cases of long standing, where vesical distension is complicated by a bilaterial renal distension. In other words, hydronephrosis originating from the latter sources is usually bilateral.

Hydronephrosis is again classified as congenital and acquired.

Congenital hydronephrosis is due, most commonly, according to Vario and Walters (Archives de Medicine des Enfants, Paris, May, 1921), to stenosis of the ureters. These authors report a case of an infant 3½ months old that died of a double hydronephrosis. The principal feature of the case was the swelling of the abdomen, which began at the age of 1 month. Two liters of the fluid were withdrawn by puncture through the abdominal wall. Death was due to uremia. Autopsy showed that stenosis of the ureters was the cause.

Congenital remains of valves in the ureter are responsible for a large group of cases. These valves are found in various states, from the rudimentary to the fully developed, composed of mucous membrane or mucous membrane with a muscularis mucosa.

The movable kidney often demonstrated as congenital by the point from which its arterial supply comes from the aorta, is responsible for many of those cases of intermittent hydronephrosis occasioned by a temporary twisting of the kidney pedicle. According to Chetwood the intermittance "lies in the emptying and refilling of the pelvis during long and uneventful periods of time, whereas the actual kinking of the ureter caused by any change in the position of the kidney results in slow renal crises of pain and oliguria." Chronic pelvic distension is usually painless; advanced cases may have no renal crises; very small amounts of urine have been withdrawn in

Digitized by Google Original from UNIVERSITY OF MICHIGAN

cases of renal crises which after the attack showed marked polyuria, out of proportion to the size of the sac.

Stricture of the ureter may be a form of congenital malformation productive of hydronephrosis, also anomalous anastomoses of the ureter's pelvic orifices, are causes of congenital origin. Abnormally high openings of the ureter into the renal pelvis result in incomplete drainage of the sac. An acute angulation of the ureter near the pelvic may produce the same effect.

An anomalous blood vessel at the lower pole of the kidney crossing the ureters so as to compress it is also a cause of hydronephrosis of congenital origin.

Acquired hydronephrosis: Causes—Tumors, calculi, stricture of ureter, tumors of bladder, tumors of kidney pelvis, extraneous tumors pressing on pelvis of kidney.

An impacted calculus in the ureter is not a usual cause; neither is one impacting the uretero-vesical orifice in the kidney. In the ureter the downflow of urine above the stone tends to produce dilatation sufficient to allow urine to trickle by and relieve the back pressure. Complete temporary occlusion of this nature may occur causing a renal crisis characterized by severe pain along the course of the ureter and gastric symptoms—nausea and vomiting.

A stricture of the ureter is produced by post inflammatory changes occuring either within or without the same. Periureteral adhesions follow the passage of calculi; occasionally from traumatism due to passing of instruments, catheters, etc.; and in a few cases from wounds.

A high insertion of the ureter into the renal pelvis is deceptive. It may seem congenital but in reality be due to kinks that are the result of adhesions which act more or less like valves.

A hydronephrosis is not produced by ligation of the ureter or any other means of sudden and complete obstruction of the ureter. Such an occurrence causes an abrupt total loss of function with resulting atrophy of the kidney parenchyma, whereas these changes are gradual in a hydronephrosis.

Acquired hydronephrosis is due to causes operating inside and outside the ureter.

Outside, the following may be enumerated: (*a*) Tumors of the abdominal organs; (*b*) abdominal effusions—ascites, etc., causing ureteral displacement; (*c*) hyperextension of the bladder.

Conditions operating inside the ureter: (*a*) Displacement of kidney; (*b*) kink of ureter, acting in manner of valves; (*c*) periureteritis with adhesions, tubercular in nature.

Prolapse of the kidney may be considered the cause or the result of a hydronephrosis, depending upon the point of view. It is easily

Digitized by Google Original from UNIVERSITY OF MICHIGAN

seen that the weight of an enlarged kidney may cause sufficient sagging to kink the ureter. On the other hand a ptosis may be acquired or the exhibition of a generalized visceroptosis, e. g., in women who have had several pregnancies.

A congenital valve in the ureteral mucosa will cause a slowly developing hydronephrosis, incomplete pelvic drainage with a gradual distension. This condition predisposes to abnormal mobility of the kidney ending in distension and hydronephrosis. That abnormal mobility of the kidney is a cause is proven by the cure resulting from kidney fixation operations. At the time of operation the point of exit of the ureter from pelvis should be investigated. A congenital valve of the urethral muscosa in the region of the verumontanum, demonstrable by retrograde catheterization, is responsible in some cases for a bladder retention which eventually leads to back pressure in the renal pelvis and hydronephrosis.

In most classifications there is a tendency to stress deficiencies as a cause of hydronephrosis even if the slightest exist. Acquired conditions may aggravate a congenital defect as in case of intermittent hydronephrosis, a condition which is the result of changing but progressive mechanical obstruction. Keith and Pulford (Journal of Experimental Medicine, February, 1923) produced hydronephrosis in dogs by placing elastic bands around both ureters. If these were removed in a week the kidney function was reestablished; if left longer permanent damage to the kidney resulted. Chloride retention occurred as well as retention of water, urea, and phenolphthalein.

The water and chloride equilibrium is closely related. If the intake of chloride is constant, the quantity in the plasma and excreted is constant. In the case of kidney injury the balance is still evident but some changes occur. If chloride and water were retained, there is no apparent rise in plasma chloride content. If chloride alone were retained the chloride content of the plasma rises strikingly. There is a remarkable rise in plasma chlorides on removal of the ureteral obstruction, due to changes in the renal function. The injured kidney regains power to excrete water and urea readily but the chloride lags. Persistent retention of the chloride in the tissues is indicated by high plasma concentration. The gradual return of plasma chloride to normal is associated with recovery of renal function involved in chloride excretion.

The experiments of these authors show how necessary it is to avoid delay in removing obstruction to urinary outflow in order to avoid unnecessary impairment of kidney function.

Pathology.—The changes present are essentially those consequent to pressure which produces an atrophy of kidney substance advancing to almost a total destruction with extensive cyst formation.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The degree of pathological change depends on the length of time the condition has existed. The pressure first produces a widening of the calyces and atrophy of the intermediate kidney substance. The capsule becomes stretched between the thickened trabeculæ and bulging occurs, giving the kidney a lobulated appearance.

The pyramids are most involved and are pushed gradually against the cortex. Multilocular cavities are formed.

The glomeruli atrophy and are replaced by connective tissue. Large hyaline areas appear in the cortex. The renal capsule thickens and the convoluted tubules dilate. The pyramidal vessels show marked ateriosclerosis. In unilateral hydronephrosis the unaffected kidney shows compensatory hypertrophy.

Symptoms.—Hydronephrosis may be present for years without symptoms. The advanced stage is evidenced by the presence of a large, smooth, rounded, or oblong tumor in the loin, which is painful to pressure and in which fluctuation can be demonstrated by palpation. There is pain at the costro-vertebral angle. Often distinct renal crisis occur, marked by pain along the course of the ureter extending to the testicles and flank, and by nausea and vomiting. A large sudden flux of urine followed by disappearance of the tumor and relief of pain is diagnostic.

The pain may be continual and severe, or intermittent in crises. Often a dull ache in the costo-vertebral angle is the only symptom, this being evident mainly when the subject is tired. In some cases of hydronephrosis of the right kidney there is pain in the right epigastrium over the gall bladder with marked tenderness and muscular spasm on palpation. The urine passed is usually pale and transparent. It may contain blood and flakes of mucous.

Diagnosis.—Pyelography has opened up an extensive field of investigation by affording a fairly accurate means of mensuration of the pelvic content and a picture of the renal pelvis in all its ramifications.

A pyelogram is made by instilling a fluid, which will obstruct the X ray, into the renal pelvis through the ureteral catheter—introduced into the ureter well up toward the uretero-pelvic junction or even into the renal pelvis. The fluid commonly used is a 15 per cent solution of sodium iodide or a 25 per cent solution of sodium bromide.

According to Marion and Heitz-Boyer the average normal renal pelvic will accept 10 c. c. without overdistention. It if accepts over 15 c. c. then they consider that a distended pelvic sac is present.

Chetwood states that a normal pelvic sac may hold as high as 30 to 40 c. c. Braasch claims that the normal pelvis holds from 5 to 10 c. c., and one containing 15 to 25 c. c. shows early hydronephrosis.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

A patient may complain of pain in the kidney after the introduction of only 5 c. c. Pain and the degree of distention present are not necessarily coordinated entities. A large sac may present little or no pain or distension with fluid whereas a small sac or a normal one may cause acute pain—even a crisis if distended. From this it is evident that pain *per se* is no criterion as to the presence or absence of hydronephrosis.

A radiograph of the distended renal pelvis presents certain signs indicative of hydronephrosis. In the early stages there is a flattening of the minor calices which gives a "clubbed" appearance to the calyx. As the condition advances the major calices widen and the clubbing becomes more pronounced. Finally the pelvic sac dilates and in the extreme case there is presented a large balloon-like area with perhaps only a slight knot on the periphery showing the location of the major calyx. Again distinct cysts with their partially separating trabeculæ are shown by the pyelogram in the advanced case.

The functional test in hydronephrosis is important. One c. c. of phenolsulphophthalein is given by intravenous injection. The segregated urines are collected and allowed to flow into an alkaline solution. In a normally functioning kidney the dye should appear on the average in 3 to 6 minutes. Delayed appearance for 8 minutes and longer indicates an impaired renal function. Thirty per cent of the dye should be excreted in the first 15 to 20 minutes; 40 to 50 per cent in the first half hour. If indigo carmine is used (5 c. c. intravenously) no alkaline solution is needed in the collecting receptacles, only a piece of white filter paper or gauze against which the dye contrasts vividly.

The flux of urine through the ureteral catheter in a normal kidney comes in jets of 4 to 8 drops every 15 to 30 seconds; in a hydronephrotic kidney the flux is a constant dropping—no ejaculations—and the urine colorless and transparent contrasted with the normal. The latter urine shows a low specific gravity and low urea content.

Differential diagnosis.—The following conditions are to be considered:

1. Ovarian cysts: These show no variation in size as to the renal sacs. Aspiration of a portion of their contents will demonstrate conclusively their nature.

2. Pyonephrosis: This condition is characterized by its systematic symptoms—fever—pus in the urine, etc.

3. Gallstones: The pain in an atypical case may be confused with that of acute hydronephrosis.

4. Nephrolithiasis: A pyelogram and an X ray of the genito-urinary tract and kidney aid in diagnosis.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

5. Appendicitis: The pain is first located centrally about the umbilicus, then localizes in the right illiac quadrant. A leucocytosis is present. The history is quite distinctive in an acute case. An X ray of the genito-urinary tract and a B A series of the gastro-interstinal tract will serve to differentiate in a chronic case.

6. Acute hemorrhagic pancreatitis: This condition may simulate acute renal crisis on the left side. The great degree of shock and quick collapse in hemorrhagic pancreatitis is diagnostic.

Treatment.—Removal of the cause is indicated. Nephrotomy with quilting or resection of a part of the distended sac may be advisable. If the condition is unilateral with no function present in the affected kidney, its removal is necessary. If the condition is bilateral and some function is present in the most affected kidney, it is advisable, in the absence of infection, to leave it alone. Plastic operations may be necessary on the ureter to relieve stricture and angulations.

Case report.—C. M. admitted from the United States Veterans' Bureau to the United States Naval Hospital, New York, June 23, 1923, with diagnosis undetermined. Complaint: Pain in the back, headache, and fever.

Clinical history: Patient had some children diseases but does not know which ones; no venereal diseases. All Wassermann tests have been negative. In 1917 after having served two years in the Army he began to have attacks of pain in the back over the kidneys. None of these attacks were so severe that he had to go on the sick list. He was given a physical disability discharge in July, 1918, on account of trachoma. In 1918 the attacks of pain began to come more frequently, accompanied with swelling of the abdomen. The attacks have since become more severe and prolonged.

In May, 1923, he was admitted to the St. Luke's Hospital, New York, with a diagnosis of abdominal tumor. He was cystoscoped and 32 ounces of fluid withdrawn. This ended the attack.

The present attack began June 1, 1923, and was severe from the start with pain in the back, headache, and high fever. The Veterans' Bureau sent him to the United States Veterans' Bureau Hospital No. 81 on the recommendation of his physician, who thought he had some nervous trouble. After an acute illness of about five days with fever up to 104° F. he improved considerably. Four days before admission to this hospital he had another attack. It is now subsiding.

Physical examination: A pale, poorly nourished white man, 31 years of age, complaining of pain in the back. He gives one the impression that the pain and distress are greatly exaggerated.

There is a globular, fluctuating tumor in the midline extending from the symphysis pubis 4 fingers upward toward the umbilicus. It feels like a large but not distended bladder.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The left kidney is palpable and appears to be irregularly enlarged. Tenderness in this area prevents accurate palpation. Pole of right kidney also palpable. Liver and spleen not enlarged. Genetalia negative. Tendon reflexes very active. July 5, catherized, 4,000 c. c. urine withdrawn. July 9, patient complains of abdominal pain; there is a circumscribed area of fluid in the left flank. Catherized, 2,500 c. c. of urine withdrawn, giving prompt relief; fluid disappearing from the flank.

Diagnosis changed to hydronephrosis, probably bilateral, with a dilated bladder.

Treatment: Daily catherization with installation of 40 c. c. of 1 per cent mercurochrome into the bladder. Catheter tightly hugged in prostatic urethra. Silver catheter used.

Laboratory findings: Urine, albumin trace, pus cells infinity. Patient runs a slight evening temperature. July 30, 1923, pyuria and pain are considerably relieved; same treatment continued. The condition continued the same for the next month. August 21, 1923, a cystoscopy done this date. Findings: Bladder markedly trabeculated and hypertrophied. Ureteral orifices greatly enlarged. Patient is now confined continuously to his bed. September 9, 1923, marked exacerbation of temperature and pulse. Temperature, 104° F. Patient complains of pain in the back and right side. From 2.000 to 3,000 c. c. of urine have been withdrawn daily in a single catheterization for the past month. September 11, 1923, temperature, 104° F. Patient on the critical list; marked cystitis present. Bladder irrigations, one-half of 1 per cent mercurochrome given b. i. d. Pyuria still present. Hyaline and granular casts, also albumin in the urine.

This febrile attack lasted until September 13, when a remission of four days occurred. Another febrile attack of the same character followed. The patient became weaker daily. Death occurred October 4, 1923. An autopsy was held. The report in detail is as follows: "Previous laboratory findings showed urine positive for albumin, hyaline, and fine granular casts, and an infinite number of white cells."

White, male, about 35 years old. Height, 5 feet 6 inches. Weight, about 110 pounds. Marked emaciation. No bruises or tumor masses on the surface of the body.

Chest: No pleural effusion. Pleura adherent to lung over the apex of left lung. No cavity formation or caseation of left lung. Right lung normal. Peribronchial glands of both lungs normal. Heart and pericardium normal. Liver, gall bladder, and pancreas show nothing abnormal.

Right kidney, 7½ inches long and 2½ inches broad with a greatly dilated pelvis. Medulla entirely obliterated, cystic and lined with granulation tissue. A large cyst of the upper pole contains fluid

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pus. The cortex is much thinner than normal and contains multiple abscesses. The capsule is greatly thickened. On trying to remove the capsule, small abscesses are ruptured.

Left kidney, 8½ inches long and 2½ inches broad with a greatly dilated pelvis. The cysts in the medulla are larger and the cortex is thinner than in the right kidney. The same cortical abscesses are present. Marked adhesions fastened the kidney to the under surface of the diaphragm and liver. Ureters markedly thickened; measure about ½ inch in diameter.

Bladder: Walls much thickened, 15 cm. at the top of the bladder. Mucosa covered with hemorrhagic spots but no real ulcers were found. Bladder measures from posterior to top, 3 inches broad and 2 inches in antero-posteriorly. There are marked adhesions in the prevesical space fastening the bladder tightly to the symphysis pubis and to the abdominal wall. Marked adhesions fastened the bladder to the rectum. The ureteral openings are both patent and greatly enlarged.

Pathological diagnosis: Hydronephrosis and pyonephrosis.

It is probable that the condition that caused the hydronephrosis lay in the posterior urethra—prostatic portion. A stricture which in course of time produced the bladder retention that eventually led to back pressure in the kidney pelvis.

The importance of early diagnosis of stricture of the urethra and its thorough and continuous treatment until cured can not be too greatly stressed in order to avoid the train of events that may lead to the production of a hydronephrosis and possible pyonephrosis. Investigation of the upper urinary tract by cystoscopy, ureteral catheterization, pyelography, and the X ray must be carried out if we are to arrive at a correct diagnosis of mechanical defects along the urinary tract and functional derangement of the kidney. This is necessary in order to place both diagnosis and treatment on a firm scientific basis.

UNSUSPECTED SYPHILIS.

By W. H. Connor, Lieutenant Commander, Medical Corps, United States Navy.

As our knowledge in any particular endeavor is gained from the assimilated experience of others in addition to what we have gained by our observations, it is most desirable that we should occasionally tabulate our observations and conclusions. In no science is it more important that the above dictum should be adhered to than in the theory and practice of medicine. By so doing, not only are we able to abstract many pertinent facts that will be of great value to us in our future work, but we may pass on something of value to our successors in practice.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Each and every one of us has a justifiable pride in making a diagnosis that will stand the test of a thorough investigation and that is commendable, but how much more elated we are if by our experience and closer observation we are able to demonstrate some salient fact that was not known, or at any rate was overlooked by a confrere and by which a correct estimate of the pathological condition is attained. True, the patient, the most vitally interested, may not be imbued with the same enthusiasm if the simple complaint with which he thinks he is suffering is found to be something that does not seem quite so harmless.

As practically every newspaper to-day has a column devoted to health and disease, the ordinary individual has, or at least thinks he has, a more lucid understanding of diseased conditions, and as his knowledge has increased so does he expect that the medical officers' knowledge has correspondingly been enhanced.

We should strive then to warrant that expectation by using every available means to make a correct diagnosis. If it is impossible to take advantage of certain necessary helps, it would be better for the time being not to give a definite opinion, for in that way the patient will not form a false idea as to his condition.

As the field of medicine to-day is so vast that it is impossible for everyone to have an intimate knowledge of all conditions, we have a right to expect a little more than the usual from the physician who is intimately associated with a specific disease, whether or not he has found in this constant contact anything of value worth recording. As syphilis in all its various manifestations has been covered by numerous authors, I can not hope to bring forth anything new. This paper has been undertaken with the idea of showing from the records of this hospital, as portrayed by erroneous diagnoses, the importance of always keeping syphilis in mind when considering obscure cases. If we eliminate those cases that are sent to the hospital with a venereal ulcer, for these are all potentially syphilitics and are admitted as such, we will find that there has been a surprisingly small number of errors.

Among the incorrect diagnoses are found epilepsy, tuberculosis of skin and lungs, neurasthenia, ulcer of skin, chronic bronchitis, and such other conditions as chronic valvular disease, osteomyelitis, etc., in which the syphilitic etiology has not been considered.

The purpose of this paper can probably best be demonstrated by tabulating the histories of several cases and pointing out, where possible, the facts that should make a diagnosis of syphilis possible, or at any rate suspected.

A chief machinist's mate of 42 entered the hospital with the diagnosis of tuberculosis of the skin.

Family history.—Negative.

Past history.—Of no importance. Denies syphilis.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Present illness.—Has an ulcer over the left eye which he states followed a slight injury over a year ago. The injury was first followed by a slight swelling which soon disappeared but left a small red patch. The patch soon ulcerated and, despite treatement, has gradually enlarged. Ulcer has not been painful. No other complaint.

Physical examination.—Well nourished individual with an ulceration of the left forehead extending into the left eyebrow. This ulcer was 25 to 35 cm. with sharp cut indurated edges. There was some destruction of underlying tissue but no bony involvement.

Pupils equal and react to light and accommodation.

Mouth and throat.—Negative. Heart, lungs, abdomen and reflexes normal. No palpable glands.

With a condition such as above we must consider tuberculosis, rodent ulcer, and syphilis. With tuberculosis of the skin we usually have a tubercular family history, or a patient in whom signs or symptoms of pulmonary tuberculosis can be demonstrated. The ulceration is usually superficial with undermined edges and occurs in individuals under 20. It is most unusual after 30.

The blood Wassermann is negative. A rodent ulcer appears late in life and usually begins as a tubercle. This tubercle has usually existed for a long time.

A syphilitic ulcer on the other hand follows an injury, is fairly deep and has sharp cut edges. The ulceration appears usually after 20 and before the age for rodent ulcer. The blood Wassermann is positive as in the case cited above. We had then in this case, even without the blood Wassermann report, sufficient to warrant a tentative diagnosis of syphilis and a therapeutic test was certainly indicated, and could have been carried out without hospitalization. In six weeks of antisyphilitic treatment, an ulcer that was a year in developing, was healed.

Fully 50 per cent of the errors have been made in the cerebral type of syphilis and as this is the form that should be demonstrated early both for the patient's welfare and for the good of the service, I have selected two cases as they present different characteristics.

The first was that of a radioman of 26 who was brought to the hospital with a diagnosis of epilepsy.

Family history.—Negative.

Past history.—Had syphilis in January, 1922, and up to October 1, 1923, had had 25 intravenous injections of the arsenicals with considerable mercury.

Present illness.—Two days before entering the hospital he had a convulsion and again on the day of admission. The last attack began with carpopedal movements and up and down motion of the jaw. There was no outcry; consciousness was lost. States that he remem-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

bers nothing from the time he lost consciousness until he awakened, one-half hour later, in the ambulance.

Physical examination.—Fairly well nourished with a startled look, skin pasty but mucous membranes do not look anemic. Pupils equal and react to light and accommodation. No glandular enlargement. Mentality excellent. Romberg negative. Spinal fluid, pressure increased; 231 cells. Globulin positive. Noguchi, four plus in all dilutions. The colloidal gold test was of no significance.

The second case was that of a water tender of 34 who came to the hospital on September 15 with a diagnosis of neurasthenia.

Family history.—Negative.

Past history.—Of no importance. Denies syphilitic infection.

Present illness.—Patient states that last February he had blisters on chest, axillæ, and back, which was called herpes-zoster. Since that time he has been nervous and easily irritated. Hands tremulous. Of late he has become irritable and seclusive. His work which previously had been satisfactory, of late has been unsatisfactory as shown by his reports.

Physical examination.—Shows a well nourished individual rather dull who speaks hesitatingly. Pupils are equal but react to light and accommodation sluggishly. No glandular enlargement. Mouth and throat negative. Heart, lungs, abdomen, and reflexes are normal. Urinalysis, negative. Hemoglobin 80 per cent white blood cells normal in number but lymphocytes are increased. Blood Wassermann negative. Spinal fluid Noguchi is positive in all dilutions.

Here we have two cases both unquestionably of the cerebral type of syphilis as proven by spinal fluid examination. In the first case we have a recent luetic history and from a review of his treatment and the many negative blood Wassermanns one might be led to disregard syphilis. However, there is no mention of a spinal fluid examination. This examination is most important and every syphilitic should be advised to submit to such an examination as soon as the blood Wassermann has become negative and at least another before a cure is even considered. As there was nothing in the physical or mental examination to warrant the suspicion of cerebral syphilis upon what then would a diagnosis be justifiable? On the history of syphilis and the loss of consciousness. Unconsciousness appearing for the first time in an individual over 20, with no traumatic history, or any other discernable cause is probably due to syphilis.

In the second case there was no history of syphilis and the blood Wassermann was negative. We have, however, some all-important leads that make the diagnosis of cerebral syphilis most probable, namely, irritability, seclusiveness, carelessness in his work, hesitancy

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in speech and one of the cardinal signs of cerebral syphilis, namely, the failure of the pupils to react normally. An increase in the lymphocytes is of slight significance. A spinal fluid examination was clearly indicated. It is interesting to note that in the last case the first dose of arsphenamine was followed in three days by a two plus blood reaction. As we have then two cases of undoubted syphilis with negative blood Wassermanns, it is not always advisable to put too much confidence in a negative blood reaction. In the last three cases the diagnosis without the specific blood reactions was possible, but in the two following a correct diagnosis without a positive blood reaction was problematical.

A Filipino of 41 entered the hospital with chronic bronchitis, possibly tuberculosis.

Family history.—Negative.

Past history.—Unsatisfactory.

Present illness.—For the past three months he has been losing weight and not feeling well. Has had a productive cough but does not think that he has had any fever. No night sweats.

Physical examination.—Poorly nourished and appears older than his age. Pupils equal and react to light and accommodation. Reflexes normal. Glands of inguinal and epitrochlear regions enlarged. Heart negative. Lungs show good excursion and no pathology, other than harsh breathing and inconstant, crepitant rales in the upper portion of the lower lobes, was found. Abdomen negative. Urine and stools negative. Temperature, pulse, and respiration normal. X-ray examination of the lungs shows no definite indication of tuberculosis, but the general appearance of upper chest is suggestive. Sputum negative for tubercle bacilli. Blood Wassermann, four plus.

While undergoing antiluetic treatment the patient gained 17 pounds in 40 days, and the lung condition cleared up. Syphilis may similate tuberculosis of the lungs, and of course it is quite possible that the two may coexist. However in this case the slight glandular enlargement and the pathology, demonstrable only in the lower half of the lungs, were certainly suggestive, especially in the absence of night sweats, fever, and tubercle bacilli. The rapid gain in weight and strength certainly would not be expected in tuberculosis, and it would be doubtful, in so short a time, even in chronic bronchitis. It would seem that a diagnosis of syphilis was warranted.

The other case was that of a chief commissary steward, age 34, who entered the hospital with chronic valvular disease.

Family history.—Of no importance.

Past history.—Was well until following the sinking of the *President Lincoln* in 1918. Since that time he has been nervous. No

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tonsillitis or rheumatism. Chancroid in 1913. Had a positive blood Wassermann in 1922. Antisyphilitic treatment following the positive Wassermann was very inefficient.

Present illness.—About 10 days ago the nervousness became more marked and for the first time he noticed that his heart was beating very rapidly. Shortness of breath followed and was more marked at night.

Physical examination.—Well nourished but with anxious face. Pupils are equal and react to light and accommodation. Reflexes normal. Romberg negative. Coarse tremor of the hands. Throat and mouth negative. Lungs negative. Heart 25 cm. to left of nipple line. A diastolic murmur in the aortic area and a harsh systolic murmur transmitted into the axilla was heard. Pulse 96 and intermittent. Blood pressure 142–58. Urinalysis negative. X-ray examination shows heart enlarged to the left. Blood Wassermann four plus. Under careful antiluetic treatment the patient made some improvement, but in two months compensation failed and death resulted.

Post-mortem examination.—Left ventricle markedly enlarged. The aortic valve was shortened and thickened. The lining of the aorta was rough and studded with nodules. The mitral valves were thickened.

Diagnosis.—Syphilitic aortitis, endocarditis, hepatitis, and splenitis.

In this case we have a lesion of the aortic valve developing without any definite cause. Hazen states that "while it is probable that there are other causes of aortic disease, still it is certain that syphilis is the chief factor in the production of this lesion." As to the advantage of determining early the syphilitic etiology, Anders states "that if the specific cause of this be overlooked, and inappropriate or the usual routine treatment of chronic valvulitis be adopted, these cases may reach an early fatal termination. On the other hand, intensive antisyphilitic treatment may, if undertaken early, bring about marked improvement and the cases progress as aortic incompetency due to other causes." Hazen, in his book on syphilis published in 1921 estimates that probably 10 per cent of the male adult population of the United States is definitely syphilitic.

With such a high incident of syphilis it would seem that a blood Wassermann should be a routine in all cases admitted to the hospital, as histories obtained from all so-called venereal cases are untrustworthy. On the other hand the presence or absence of a positive blood Wassermann should not be the only factor in establishing a diagnosis of syphilis, for if such is the case we will again drift into error. It is by placing the proper value upon the history, physical

Digitized by Google Original from UNIVERSITY OF MICHIGAN

examination, blood and spinal fluid Wassermann that we can expect to arrive at the proper diagnosis.

If we remember the percentage of syphilitics in the country and realize that there is probably no disease that syphilis can not imitate, our errors will indeed be small and the preparing of a paper on unsuspected syphilis will become correspondingly difficult.

THE RISE OF LOCAL ANESTHESIA.

CHARLES A. INGRAHAM, M. D.

To Dr. Oliver Wendell Holmes is due the credit of having coined the word "anesthesia," concerning which he eloquently wrote: "Nature herself is working out the primal curse which doomed the tenderest of her creatures to the sharpest of her trials, but the fierce extremity of suffering has been steeped in the waters of forgetfulness and the deepest furrow-knotted brow of agony has been smoothed forever."

Another remark of Doctor Holmes in connection with this subject was an observation he made in regard to the monument erected in Boston in 1867 to the honor of the discoverer of the anesthetic properties of sulphuric ether, namely, though Dr. William T. G. Morton, a dentist of Boston, first publicly demonstrated in that city on October 16, 1846, that the inhalation of ether would prevent all pain in a surgical operation, Dr. Horace Wells, a dentist of Hartford, Conn., claimed for himself the credit of having revealed anesthesia to the world in his use of nitrous oxid, or "laughing gas." The city of Hartford has accordingly erected a statue of Doctor Wells in its midst and inscribed it with the words:

HORACE WELLS
Who discovered Anesthesia,
November, 1844.

Upon the Boston monument, however, though Doctor Morton is clearly implied, no name of an alleged discoverer of ether or of anesthesia, for an obvious reason, appears, and Doctor Holmes having been asked the identity of the person thus honored, replied facetiously, "It is a monument to "either" (ether).

A long and acrimonious controversy was carried on by Morton and Wells for the distinction of having discovered anesthesia, while Charles T. Jackson, a prominent scientist of Boston, and Dr. Crawford W. Long, of Georgia, entered the lists and fought for the honor assumed by Morton. The former claimed to have communicated to Doctor Morton the idea of administering the inhalation of ether for the prevention of the pain of surgical operations, while

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Doctor Long averred that he had been the pioneer in etherization in an operation made at Jefferson, Ga., March 30, 1842. The fiercest and most prolonged dispute seems, however, to have been waged between Jackson and Morton. Immediately after the famous operation with ether in 1846 Doctor Morton applied for and finally secured a patent on the discovery and sold to applicants the privilege of employing ether by inhalation, much to the disgust of physicians for this flagrant violation of professional ethics. The controversy reached even to the doors of Congress, where a committee decided in favor of Morton, and the great dispute continued in books and medical journals even after the four claimants were silent in the grave. It is a sad thought that these men who accomplished so much for the benefit of their fellows should have wasted their time and health in profitless contention, instead of congratulating themselves and rejoicing that they had been of such signal blessings to the world. Doctor Morton undermined his health and died at the comparatively early age of 49 years, worn out with litigation and anxiety. Doctor Wells, grieved and disappointed at the ignoring of himself by Morton and Jackson in their assumption of the discovery of anesthesia, lost his mind and committed suicide in 1848. He was but 33 years of age. The deaths of Jackson and Long are believed to have been hastened by the excitements and wranglings involved in the ether controversy. To American dentists belongs the honor of having introduced this great benefaction to the world. In fact, this country can indubitably claim the credit of having not only discovered both general and local anesthesia, but of having led in their development.

The world from remotest times had been groping for some process or medicament which would alleviate or prevent the pain of surgical operations.

Upward of 2,000 years ago our Savior, enduring the agonies of the cross, refused the draft of wine mingled with myrrh which, as was the custom, had been mercifully offered Him as an alleviation of His pain. In ancient times many methods of effecting general and local anesthesia were employed with partial success. The Assyrians, by pressure on the carotids of the neck, produced unconsciousness, and from this fact these blood vessels were called by them " arteries of sleep." Indian hemp was administered to procure relief from the pain of injuries and operations. The Arabians practiced continued pressure, by means of pads and tourniquets, on the nerve trunks, thus benumbing the parts to which they are distributed, while a belief prevailed that operations performed with instruments made of the precious metals, silver or gold, were less painful than those of the base materials of bronze or iron. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

application of cold to produce local anesthesia has been practiced from remotest times; in Napoleon's retreat from Moscow in 1812, owing to the benumbing effect of the low temperature, soldiers with frozen members went through amputations without pain. For many minor operations the parts are now benumbed or frozen by forcing a rapidly evaporating spray upon them, and it is a singular fact that the freezing of the tissues in a small area and for a brief space of time seems to have no injurious effect upon them.

While general anesthesia remains practically as when first successfully introduced in 1846, having attained its purpose in one public trial, local anesthesia, then in its infancy, has developed until there is no surgical operation which may not be rendered painless by its employment. This consummation has been of inestimable value to humanity, for there are many cases where the patient has so great a dread of lapsing through general anesthesia into a state of profound unconsciousness, from which there is always a possibility that he may never awaken, that it precludes the gaining of his consent for a needed operation. There are, also, conditions other than apprehension which forbid the administration of ether or chloroform, such as diseases of the heart or lungs, a plethoric habit of body and advanced years. It should be said, too, that the dread specter of the surgeon, the "shock" which follows major operations and which is not infrequently fatal, is less to be feared under local anesthesia. The advance which has been made in recent years in the substitution of local for general anesthesia has been so rapid that the public is unaware of the astonishing development which has been reached. This fact, to the writer, is rendered of deep interest by his memory of an occasion when, as a medical student, he witnessed in a clinic the death of a man from the inhalation of ether who was about to undergo the amputation of a finger. It was the most fearful exhibition in all my professional career, but it is a reassuring thought that in this day that tragic event could have easily been avoided by the use of local anesthesia.

The development of local anesthesia to the wide and increasing usefulness which it now enjoys would have been impossible without the hypodermic syringe, which simple instrument was invented in 1845 by Francis Rynd, of Edinburgh, Scotland. It was not till the lapse of many years, however, that it was discovered by Von Anrep in 1879 that an injection of cocain solution beneath the skin was followed by complete insensibility of the adjacent parts. In 1884 it was clearly shown by Karl Koller that this practice was available for many painless surgical operations and it was rapidly adopted by dentists and physicians. It was found, however, that cocain quite frequently exerted fatal effects when thus employed, but

Digitized by Google Original from UNIVERSITY OF MICHIGAN

substitutes were sought and discovered which are equally efficacious and of practically no dangerous qualities.

The great advantage of medication, both general and local, through injections with the hypodermic syringe, are the rapidity and energy of the effects produced, only 3 to 15 minutes being required to anesthize the part to be operated upon. It was soon discovered that though the desired area could be rendered insensible by merely injecting the anesthetic into the tissues, that by depositing it near or in a nerve trunk, the parts to which it was distributed would become temporarily paralyzed. This method is called "block anesthesia," for the reason that beyond the point of puncture the sensory nerves are blocked or cut off from communication. Nerve blocking was first practiced for a major operation by Dr. George W. Crile, of Cleveland, Ohio, in 1897. Strange as it may appear, the puncture of the nerve is painless, provided it be slack.

Having succeeded in blocking nerve trunks, it is not surprising that venturesome surgeons should advance into the spinal cord, itself. This was accomplished in Germany by Bier, who reported in 1899 that he had made eight successful demonstrations, securing anesthesia from the feet as high, in some cases, as to the navel. This bold procedure has been considerably practiced in this country, and in competent and careful hands is now considered safe. The puncture is made with a specially constructed syringe and needle between two of the vertebræ of the lumbar region and on into the subarachnoid space, just outside the spinal cord. The duration of the anesthesia thus produced is from three-fourths to one and one-half hours.

An interesting and singular fact connected with the injections used for local anesthesia is that the addition to them of adrenalin, derived from the suprarenal glands of the kidneys (those of sheep and oxen being used), renders the anesthetic less toxic and dangerous. In the case of cocain, before other similar but safer agents were discovered, the employment with it of adrenalin revived the use of this precarious and hazardous drug. Adrenalin also increases the power of the anesthetic, permits of a larger amount being injected and prolongs the desirable influence. The explanation in part of this action is that adrenalin is the most powerful vaso-constrictor that has been discovered, and its effect on the small blood vessels is to constrict them and thus to delay the absorption of the anesthetic.

Anesthesia has an extensive literature in which, step by step, the high development of this merciful procedure may be followed. The consideration of the subject suggests the idea prevalent in olden times, that for every ill there is in nature's medicine chest of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

herbs and minerals an appropriate cure, and begets the hope that as time runs on there will be no pain or sickness that can not be controlled. In the realms of medicine, surgery, and hygiene there is ever progressing an energetic endeavor to this end, and as no limit can be set to improvement, to invention and discovery, the future doubtless holds in reserve astonishing things for the physical advantage of mankind. Learned and advanced as we believe ourselves to be, we have as yet but stirred a little the surface of the mines of healing which are hidden in the intellect of man and in the infinite repositories of nature.

83393—24——3

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

CLINICAL NOTES.

SARCOMA.

WITH A REPORT OF TWO INTERESTING CASES.

By R. M. Choisser, Lieutenant, Medical Corps, United States Navy.

A sarcoma may well be defined as a malignant neoplasm arising from and consisting of cells of mesenchymal origin. This definition while not technically exact does accomplish a great object and for all practical purposes is correct. It gives us something tangible upon which we can begin our study of neoplasia, as it serves the purpose of separating an enormous group of malignant tumors from those arising from the ectoderm, namely, the carcinomata.

It will be remembered that the embryonic mesenchyme is the middle portion of the three blastodermic layers of the body, the ectoderm, mesoderm, and entoderm and that different tissues originate and develop from one or more of these layers of embryonic blastoderm. From the mesoderm we have developed all of the connective tissue including the bone, cartilage, muscles, blood vessels, heart, fibrous tissue, and the entire system of lymphatics. As one or more combinations of these various tissues exist in all parts of the human body, and as a sarcoma is a malignant tumor derived from mesenchymal cells, it is not surprising to see that this type of tumor may be found in any part of the body, although clinically they occur more often in some places than in others. Thus, for example, Ziegler finds them more frequent in the skin, fascia, intermuscular connective tissue, bone-marrow, periosteum, brain, and ovaries.

In comparing the age of incidence of sarcoma with other malignant tumors, records show that they tend to occur earlier in life than do carcinomata. This fact, however, is unreliable in differentiating the two neoplasms even clinically, as cases are reported of the epithelial tumors occurring in infancy. While it is generally known that sarcomata are often encountered in early life, they are not more frequent at this time than in later years, as is generally believed. Their percentage of incidence, just as with the carcinomata, increases in the higher age periods. Records show that all malignant tumors are more common after 35 (the cancer age) and that the curve reaches its height at about 60 or 70 years. Delafield and Pruden show that when the curve of incidence of carcinoma is compared with that of sarcoma that both rise for a time as age advances and

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

then fall; but whereas the decline in the case of the curve of carcinoma sets in at 60 or 70 that for sarcoma begins at about 50. This probably accounts for the erroneous conception that sarcoma is more common in early life than in the advanced age periods.

Sir John Bland Sutton speaking of sarcoma in his excellent treatise on tumors states that "This tumor is the most general one that affects the human body. It may occur in any tissue, fibrous, osseous, cartilagenous, muscular, etc. It attacks the body in all periods of life from the fetus in utero, child just born, to extreme old age." Ziegler reports a concrete case of sarcoma developing in embryonic life, the origin of which was referred to a local malformation.

The growth of sarcomata is, as a rule, rapid and destructive and when occurring in unusual places may mimic very closely in physical signs an inflammation. They always have an abundant blood supply and tend to expand locally by a proliferation of their cells upon a framework of blood vessels. They also, at times, attempt encapsulation and in so doing close off the surrounding lymphatics. This is in contrast to the growth of carcinomata whose cells, like cancer cells, respect no capsule nor tissue and are found at an early date in the adjacent lymph nodes. As the vascular system of the sarcomata is abundant it is also immature, with poorly formed deficient walls. It is readily seen, therefore, how these vessels are early invaded by the tumor cells, which lead to circulatory metastases in distant tissues, resulting in a generalized sarcomatosis.

Considering the vascular system as the method of metastasising, the most logical site of primary lodgment of these tumor fragments is the lungs and that is exactly what happens. This condition often occurs at an extremely early date and it is not uncommon to find extensive pulmonary metastases long before the original lesion has been diagnosticated. I recall the case of a patient some time ago in the naval hospital at Washington, who a year prior to his death had his right testicle removed, the diseased portion of which was diagnosed microscopically sarcoma. He apparently made a good recovery, but in a few months he developed the symptoms and signs of pulmonary tuberculosis. The causative organism, however, was never isolated. He died soon after the onset of the acute symptoms and autopsy revealed instead of tuberculosis, extensive diffuse pulmonary metastatic sarcoma. It is interesting to note that a patient suffering with an early pulmonary metastatic neoplasm may present symptoms and physical signs closely simulating those charateristic of tuberculosis. Beatty and Dickson in their "Special Pathology" state that any obscure pulmonary condition presenting the symptoms and signs of tuberculosis and in which the tubercle bacillus can not

Digitized by Google Original from UNIVERSITY OF MICHIGAN

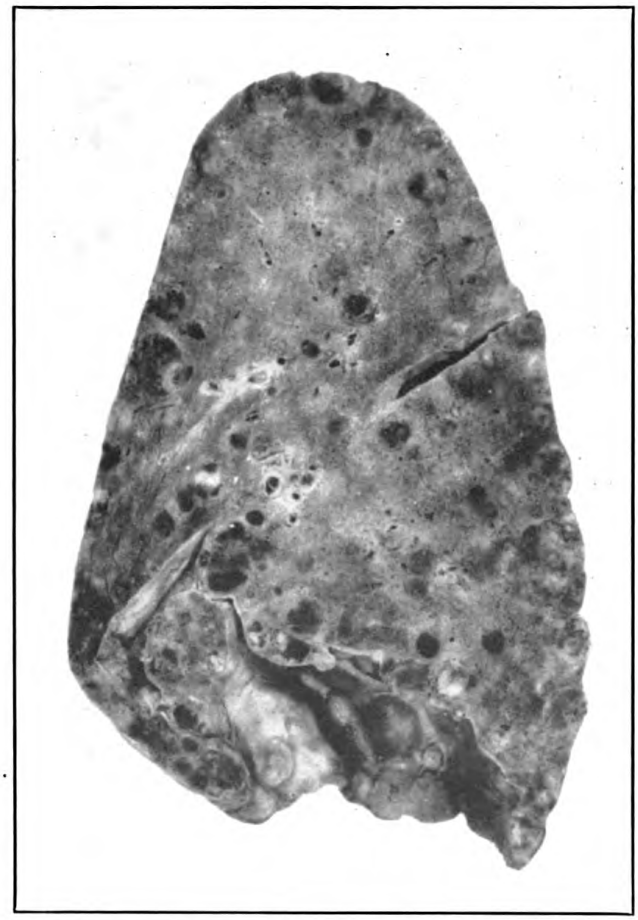


FIG. 1.—METASTATIC SARCOMA OF THE LUNG.

452—1

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

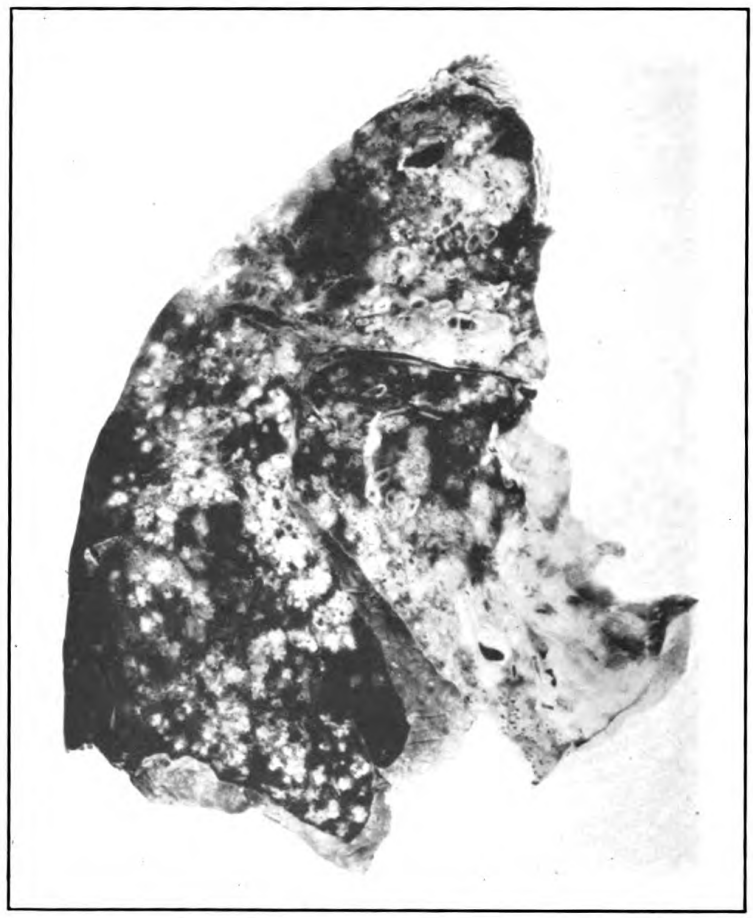


FIG. 2.—DIFFUSE MILIARY TUBERCULOSIS OF THE LUNGS.

452—2

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

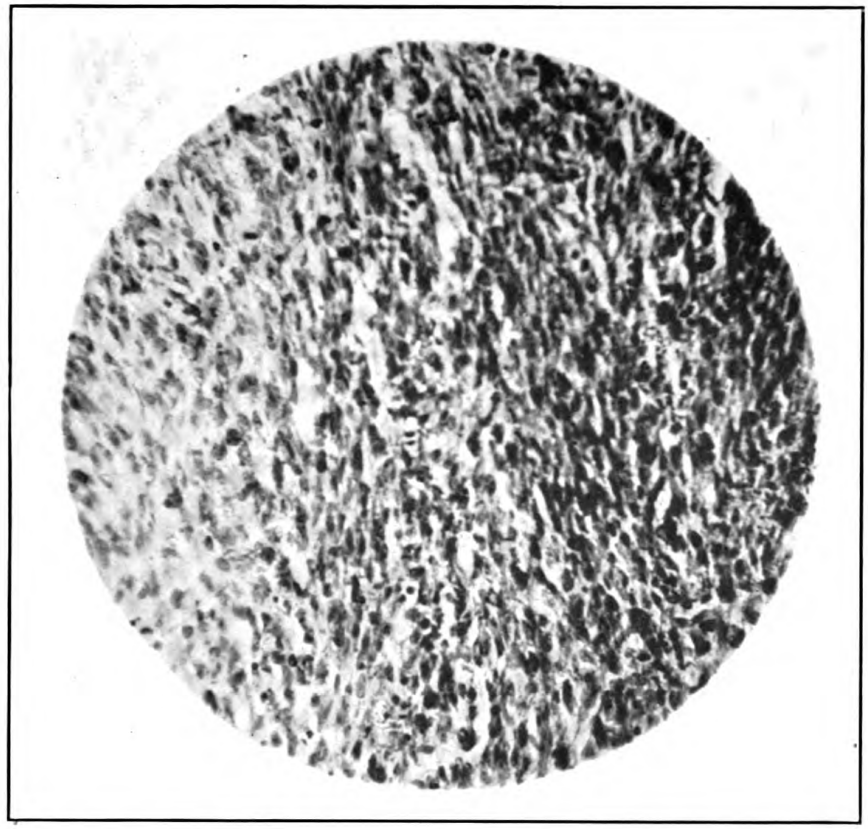


FIG. 3.—MYOSARCOMA OF THE CERVIX UTERI.

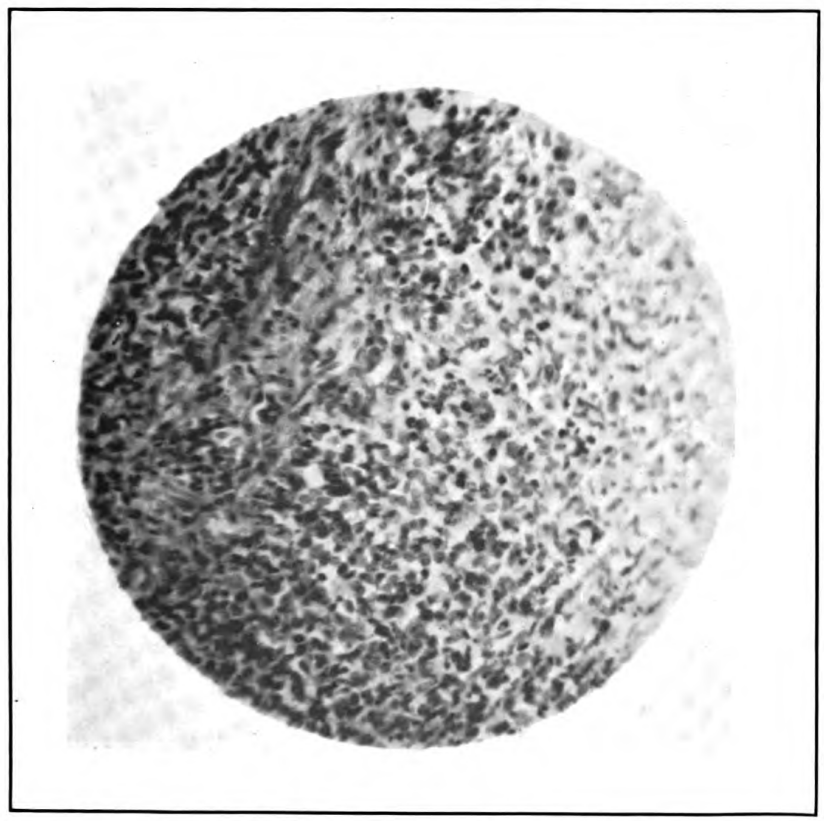


FIG. 4.—FIBROSARCOMA OF SOFT PALATE.

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

be demonstrated should be considered suspicious of metastatic sarcoma.

Regarding the classification of sarcoma Ewing gives two methods. The first is by means of the cell form and the second, according to cellular histogenesis. The former method is the one most commonly employed and divides the tumors into three groups, the spindle cell, round cell, and giant cell types. This obviously conveys little information unless the tissue of origin can be stated, as any of the three types of cells may occur in the various mesoblastic tumors.

The second method of classification, according to histogenesis, is more exact and comprehensive, as the name of the tumor itself will immediately reveal its character. The one law governing tumors that is generally accepted, states that any neoplasm, regardless of its embryonic relationship, whether malignant or benign, tends to grow and reproduce the mother tissue of origin. As an example, a benign tumor consisting solely of highly differentiated fibroblasts is naturally a fibroma. A benign muscle tumor consisting of an overproduction of normal adult sarcocytes is a myoma and, in the case of bone, osteoma or cartilage, chondroma.

As this is the nomenclature generally accepted for benign mesoblastic neoplasms and as a sarcoma is simply nothing more than a malignant mesoblastic tumor, why should we not then use the tissue of origin as a prefix and add the word sarcoma to complete the name of the malignant types? An example of this would be fibrosarcoma, myosarcoma, chondrosarcoma, and so on down the whole line of mesoblastic tumors. This method gives us at once a mental picture of the type of tumor concerned. We may also add, if desired for elucidation, the cellular characteristics of the lesion as described in the first method of classification and call it, for example, a spindle cell or giant cell fibrosarcoma, depending of course upon the type of the predominating cells.

MacCarty in his excellent paper, "The Biological Conception of Neoplasia," published in the American Journal of Medical Sciences, May, 1919, described a new growth as nothing more than an overproduction of cells normally found in the body. Those that are composed of adult highly differentiated cells are benign in character, while those consisting of immature cells showing little or no differentiation, are malignant. In the former case the cells are mature and show no tendency to invade the surrounding tissues any more than a normal adult cell of any part of the body; while in the latter instance they are young and undifferentiated and are possessed with that inherent potentiality characteristic only of embryonic tissue.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Granting that MacCarty is correct in his definition that neoplasms are composed of cells normally present in the body, how can we then have such a tumor as a giant cell sarcoma, because giant cells are not normal tissue cells; they are always pathological. The term is simply a descriptive misnomer which conveys practically no information. Round cells are normal in the body. They compose practically the entire lymphatic system, consequently we are justified in using the term round cell sarcoma, provided we are referring to sarcomata of lymphoid origin. There is nothing gained, however, by doing so when it is so easy to follow the histogenic classification and call it a lymphosarcoma which, we know by its name alone, is a round cell tumor.

This latter method of classifying sarcomata is coming into general use more each day, because in reality it is the only one that conveys real information and a true understanding of the various types of connective tissue tumors.

A review of the literature for the past five years reveals reported cases of sarcomata arising from almost every part of the body, and it is interesting to note the wide variation in the age of incidence. The youngest case reported is by E. B. Cayse, in the Journal of the Tennessee State Medical Association for April, 1921. This was a congenital sarcoma of the orbit occurring in a child 21 days old. The tumor infiltrated the entire bulbus oculi and adjacent structures. It was treated locally by radium with beneficial results for a short time, but eventually metastasized and caused death. The oldest case was reported by Douglas Guthrie in the Journal of Laryngology for October, 1918. This was a sarcoma of the tonsil in a man 45 years of age. The tumor was removed surgically and treated by radium, but speedily recurred and finally caused death by asphyxiation.

Of the many cases of sarcoma found in the current literature, it was of interest to note that practically every organ of the body was reported as being the primary origin of this type of tumor.

The two cases of sarcoma reported below are of interest for two reasons, first, because of the uncommon places of origin and, second, because they represent the two extremes of age incidence.

Case No. 1 occurred in a child 23 days old which was probably congenital in origin; however, it did not manifest itself until three weeks after birth. Aside from the interesting fact that the neoplasm occurred so early in life, it is worthy of note that its location—the soft palate—was rather unusual. This case was a patient of Drs. H. F. Strine and H. Hertzberg, of Washington, D. C., through whose courtesy the following clinical information was procured. Doctor Hertzberg reported that on April 5, 1923, "I was called to see G. S., an infant girl, whose birth I had attended three weeks previously.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The mother informed me that the baby had cried a great deal for the past 48 hours, slept poorly, and nursed with some difficulty. The mother, aged 24, is a well-developed and healthy woman; the father, aged 29, also is a well man. They have an older child, a girl, aged 4½, who is normal in every respect. Mrs. S. was under my care during her pregnancy and parturition and there was nothing abnormal during their entire course. The baby was born in the Garfield Hospital on March 13, remained there for 10 days, and during that period nothing unusual was discovered by either nurses or myself. On April 5, upon examination, I noticed that the baby was very restless. It had apparently gained in weight, however, and had a good color. The temperature, pulse, and respiration were normal. Head, neck, chest, abdomen, and upper and lower extremities presented nothing of importance. Looking into the baby's mouth I noticed that about the center of the right buccal mucous membrane there was a conical shaped enlargement the size of a nickel protruding into the buccal cavity in the intermaxillary space. It felt semisolid to the touch with some fluctuation in the center. I made a tentative diagnosis of abscess or neoplasm, most likely sarcoma. Upon aspiration with a small syringe about 5 c. c. of blood was withdrawn. Doctor Strine was called in consultation the next day and likewise aspirated a similar amount of blood. The child was removed to the Children's Hospital and referred to Doctor Merritt for radium treatment, but the latter was deemed inadvisable, as the insertion of radium needles would necessarily cause severe hemorrhage in the extremely vascular growth. In a few days the submaxillary and submental lymph nodes on the right side became visibly enlarged and confluent with the original growth above. The roof of the mouth and the nasopharynx likewise became involved, causing a progressive dyspnea. To facilitate respiration the child held its head in extreme posterior flexion (extension), a voluntary opisthotonos-like position of the head, which flexed anteriorly caused immediate dyspnea and cyanosis. Feeding even through a nasal catheter was getting more difficult every day. The child died on April 13 at the age of 1 month, very likely from asphyxia, as reported by the hospital interne. Permission for a complete autopsy could not be obtained. Pieces of the tumor excised by Doctor Strine and myself were given to the United States Naval Medical School for microscopic examination.

Histopathological report: The specimen, which consists of two pieces, was received in 10 per cent formalin solution. One is labeled soft palate and the other, which is smooth and oval, labeled regional lymph node. They are both firm to touch and cut with resistance, revealing smooth white surfaces.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Sections stained with haemotoxylon eosin show the histogenesis of the two tissues to be indentical, in that their original structure has been completely displaced by large, deeply staining, oval, irregular cells. These cells vary markedly in size and chromatin content and contain well defined dark staining nucleoli. Numerous mitotic figures in various stages of development are seen throughout the sections. Very little stroma can be made out in either except in a few isolated areas and in the region of the blood vessels, which are quite numerous. In these places the large cells tend to flatten out and gradually merge into a more highly differentiated form of connective tissue. Diagnosis: Rapidly growing fibrosarcoma.

The characteristic predominating cell can be clearly seen in the accompanying photomicrographic illustration. These cells at first glance seem to be more round than oval and without further study may lead to the erroneous and misleading diagnosis, round cell sarcoma. Such a diagnosis, while not influencing in any way the prognosis, indicates that the tumor was lymphatic in origin or, in other words, a lymphosarcoma.

If the section now be studied a little more in detail it will be seen that these large, immature oval cells tend in places to differentiate into the more mature types and to reproduce the mother tissue of origin, which can be readily recognized as fibrous tissue, consequently we have a fibrosarcoma and not a round cell tumor.

Case No. 2 is presented through the courtesy of Lieut. J. J. Mundell, Medical Corps, United States Navy. It is one of a myosarcoma of the cervix uteri in a woman 68 years of age. The interesting feature of this case is the comparative rarity with which sarcoma originates in the uterus, especially the cervix. Cullen states that malignant neoplasms of the uterus are, in the majority of instances, epithelial in origin and of the mesoblastic tumors that are encountered less than 12 per cent originate in the cervix. The patient, M. A., a widow aged 68, a native of Syria, was admitted to the hospital October 1, 1923. She was unable to speak or understand English, consequently very little history could be obtained except that she had 14 children and was complaining of abdominal pains and a bloody vaginal discharge. The condition first came to her notice in July, 1922, when she was attacked with pains in the abdomen and back. These pains remained constantly until January, 1923, when a bloody discharge was seen coming from the vagina. This discharge became more profuse and foul until, becoming very much weaker and having lost considerable weight, she was taken to the hospital. Examination showed that although very much emaciated her circulatory and respiratory systems were very slightly impaired.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Vaginal examination showed the cervix to be ulcerated, nodular and in parts gangrenous, a very profuse, offensive bloody discharge being continually present. The anterior and posterior vaginal walls were also affected. Large, hard immovable masses in the lower abdomen were found which reached on the left side to the level of ubmilicus. Preliminary diagnosis: Carcinoma cervix uteri, advanced, inoperable. The patient died November 15, 1923.

Permission for an autopsy was not obtainable. A specimen of the cervix was removed at biopsy and submitted to the United States Naval Medical School for examination. It was found to be a connective tissue tumor, malignant myosarcoma.

The sections show the tissue to consist of masses of spindle cells closely resembling young fibroblasts and sarcoblasts. These cells make up the bulk of the tissue and are apparently growing without regard for the laws governing reproduction. Numerous mitotic figures are seen throughout the tissue. Hemorrhagic areas and new formed blood vessels are numerous. Around the periphery of the section necrosis and acute inflammatory reaction is quite marked. It is believed from the character and arrangement of the cells that the lesion is a rapidly growing spindle cell myosarcoma.

These two cases recorded above represent a number of interesting points regarding neoplasia. They show in the first place that sarcoma, the most general malignant tumor, may arise at any age and that it ofttimes occurs in most unusual places with various manifestations. In the case of the infant, considering the age, rapid development and stormy symptoms, the whole process may easily have been mistaken for an inflammation, which undoubtedly would have led to a favorable prognosis. These points should be considered at all times in making a diagnosis of any obscure lesion. We should always bear in mind the possibility of malignancy, and when the least doubt exists regarding the true nature of a given condition a microscopic examination of the tissue should be made. It is by this means and this means only that we are able to detect a beginning malignant transformation. By so doing we not only establish an accurate diagnosis, but also open the way to early intensive treatment, which is our only chance at the present time of combating malignancy.

AVULSION OF SCROTUM, LEFT TESTICLE AND SHEATH OF PENIS.

By G. F. Cottle, Lieutenant Commander, Medical Corps, United States Navy.

On May 14, 1923, while engaged in the performance of his duties in the engine room of his ship, McS., engineer, first class, United States Navy, age 31, received a very unusual injury. While repairing a gear on a revolving shaft in the bilges his dungaree trousers

Digitized by Google Original from UNIVERSITY OF MICHIGAN

were caught by a projecting pin and wound upon the shaft. As they tore and he resisted the pull, the trousers were stripped from him producing the injury. Upon admission to the naval hospital, Brooklyn, N. Y., examination showed that the entire scrotum and left testicle were missing, and that all of the skin and superficial fascia of the penis was gone, leaving the penis bare of covering except at the glans and leaving the right testicle and cord bare. The denuded structures were raw, bleeding, and grimy with dirt, grease, and hair (see Pl. 1). A brief period of shock was followed by a very definite psychic depression. The patient knew full well what had happened to him and he had very little hope that repair was possible. For two days the denuded area was carefully cleansed of hair, dirt, and bits of clothing and kept bathed in Dakin's solution. During this period of surgical cleansing the surgical staff gave considerable thought to the question of what could be done to improve the condition of this patient.

The surgical indication was clear enough; make a new scrotum for the denuded right testicle and make a new covering for the denuded penis. The best method to accomplish the desired result was, however, up for discussion. Woolf grafts were thought of and voted down; many plastic procedures were suggested. Finally the decision was reached to be content with an attempt to meet the obvious need and get the raw areas covered, leaving to a later date definitely planned plastic procedures aimed at restoration of function. It was decided to tuck the denuded right testicle and cord beneath the skin and superficial fascia of the right thigh and to insert the denuded penis in a tunnel to be made in the left groin between the skin and superficial fascia and the deeper fascia of the thigh or abdomen in that region.

At operation May 17, 1923, an external urethrotomy was first made and a catheter inserted into the bladder to sidetrack the urine from the field of operative interference to aid healing. This step it is now believed may have been unnecessary. It was at the time, however, considered essential. A wide area of skin and superficial fascia was then lifted from the inner aspect of the right thigh to form a loose pocket for the right testicle and cord. Next the skin and superficial fascia over Poupart's ligament were lifted up and a tunnel made with an opening in the skin cut at the outer end. Into this tunnel the denuded penis was drawn and the little collar of foreskin at the sulcus was sutured to the opening in the skin made at the distal end of the tunnel. (See dotted lines, pl. 2, fig. 1.)

Five weeks later, June 22, 1923, the urethrotomy wound was almost healed, the patient was passing urine through the meatus, the penis lay comfortably in its new and unusual bed and, to our surprise, both

Digitized by Google Original from UNIVERSITY OF MICHIGAN

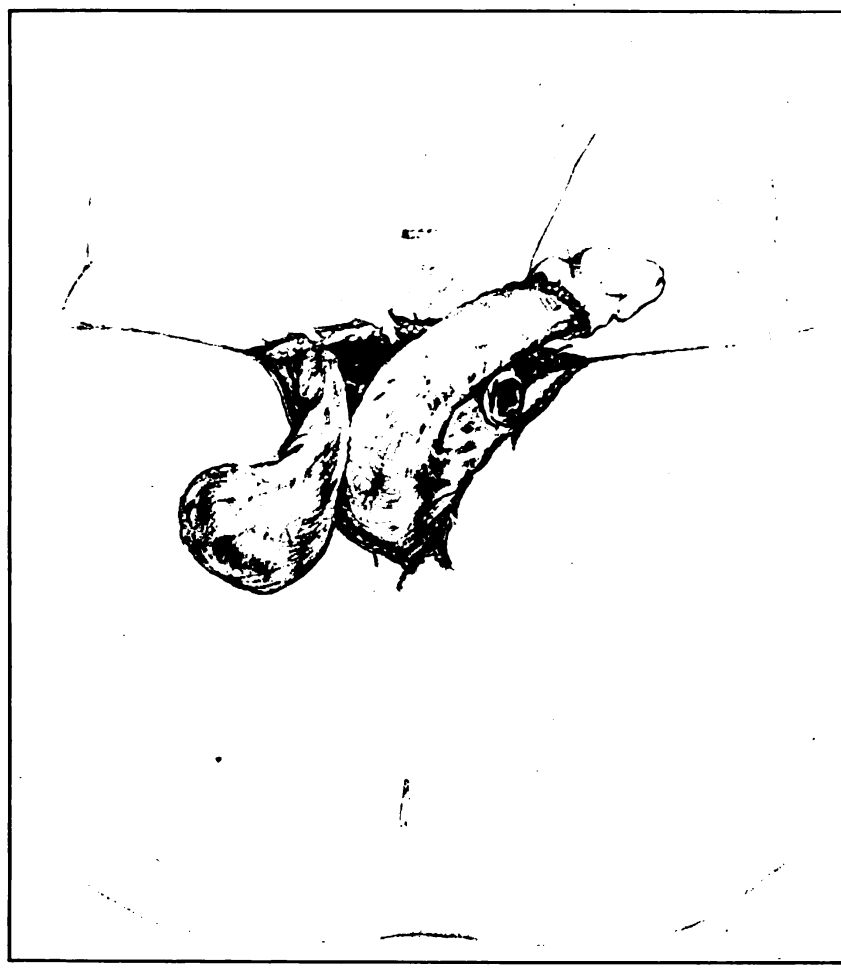


FIG. 1.—COMPLETE AVULSION OF SKIN OF PENIS AND SCROTUM AND OF LEFT TESTICLE.

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

testicle and penis moved freely beneath their new coverings. The wounds were healing rapidly where a little of the new flaps had been lost and the patient was happy and hopeful. Erection occurred without pain, and the patient was able to urinate without difficulty.

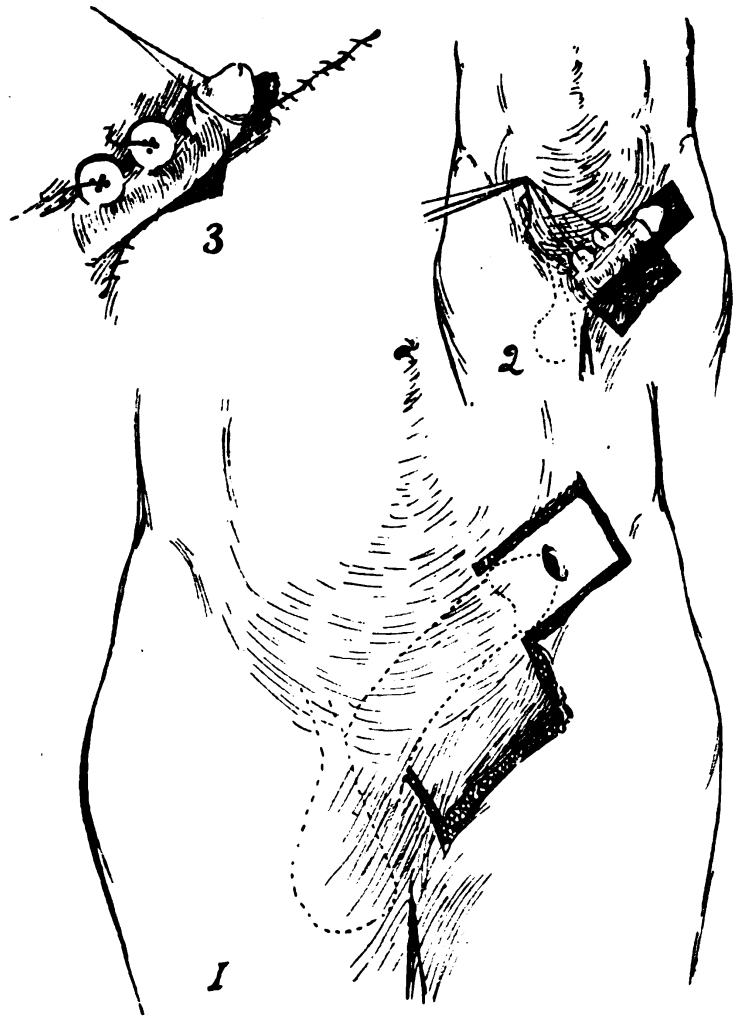


FIG. 2.—Plastic operation on penis.

The remaining problem was now quite simple. It remained only to free the penis from its bed and in freeing it to obtain for it a complete well-nourished, encircling covering. The plastic operation which accomplished this purpose was done in two stages. The first stage, August 10, 1923, freed a large flap of skin and superficial fascia already covering the penis on one side and sewed it around the penis, leaving a broad pedicle above to maintain blood supply to the flap. (Pl. 2, figs. 1, 2, 3.) The second stage, October 16, 1923, severed the now covered penis from its broad pedicle above, making it once more a practically normal organ. (See pls. 4 and 5.) The

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

new home of the right testicle is convenient, comfortable, and satisfactory, in need of no further treatment. The new sheath for the penis has pubic hair growing upon one side. Should this prove an annoyance the hair follicles can be destroyed by electrolysis or the growth removed by depilatories or by shaving. These three operations and six months' time have restored to normal appearance and function a young man whose original injury had made him devoid of hope of real repair and restoration of function.

A CASE OF HYDATIDIFORM MOLE.

By C. C. KRESS, Lieutenant Commander, and H. C. BISHOP, Jr., Lieutenant, Medical Corps, United States Navy.

The case of hydatidiform mole herein reported is interesting not only because of its infrequent occurrence generally, but also because it is exceptionally rare in the work of the Medical Corps of the Navy, where there is always a very limited amount of gynecological experience. It is especially noteworthy that such a condition occurred in a native of Samoa, where pathological structures in women such as carcinoma and fibroid of the uterus are almost unknown.

In this report it should be kept in mind that the history of the native is difficult to obtain and can not always be depended upon, but the facts enumerated here are correct as nearly as can be determined.

Hydatidiform mole, according to French writers, is found once in 20,000 cases; according to one American observer (Edgar) four times in 15,000. According to the latter figures the possibility of its presence should never be overlooked where there is a sign of abnormal pregnancy. The mortality is about 19 per cent (De Lee).

The present case is that of a Samoan woman about 36 years of age, who was admitted to the Samoan Hospital complaining of severe pain in the lower part of the abdomen, headache, and a slight discharge from the vagina. Her past history is given as having nine children (living), two miscarriages, one three years ago, the other seven months ago. To the latter she ascribes the beginning of her trouble. She states that she has not menstruated since this miscarriage. The present trouble began at this time, but she states that she was not really ill until three months ago, when she began to have pain in the lower abdomen and occasionally vomited. The pain became gradually worse and when the discharge began she came to the hospital.

Examination showed a definite mass in the uterus more on the right side, somewhat tender on palpation externally, causing enlargement of the uterus, the upper border being about 1½ inches below the umbilicus. Vaginal examination showed the same mass and a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

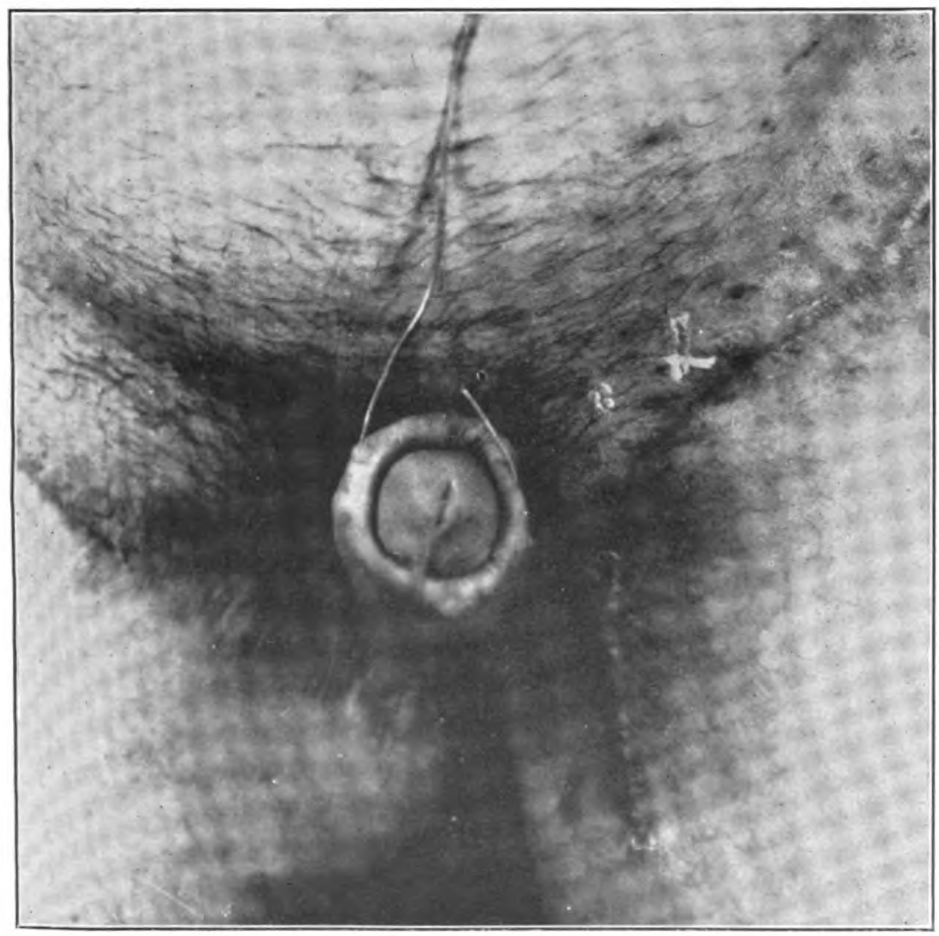


FIG. 3.—PLASTIC OPERATION ON PENIS. FINAL RESULT.

460- 1

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



FIG. 4.—PLASTIC OPERATION ON PENIS.
FINAL RESULT.

460 - 2

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

serosanguinous discharge from the uterus slightly less than a normal menstrual discharge. At this time local hot applications were given to relieve the pain.

After four days in the hospital the patient began to complain of constant dizziness, worse at night, and at this time she began to vomit frequently. Sodium bicarbonate and bismuth were given to control the vomiting. This was successful after two days.

From this point on there was gradual improvement, except for the discharge, which continued. After three weeks there was no nausea and only slight dizziness at times.

There was slight perceptible increase in the uterine tumor and some pain in the legs. From this time nothing noteworthy occurred until the sixth week of stay in hospital, when attention was called to the fact that there was a marked increase in the size of the tumor (the border of the uterus had reached the umbilicus), and the discharge began to increase and to become more sanguineous. The following day the patient had a severe hemorrhage from the uterus followed by the passage of several clots. This stopped only to be followed by another an hour later. At this time the loss of blood was so great that it was decided to empty the uterus at once. The patient was taken to the operating room, put on the table, and before anything was done or any anesthetic given she spontaneously emptied the uterus of a large mass of cysts varying from the size of a pea to a walnut, accompanied by a mass of degenerated tissue which was easily recognized as a hydatidiform mole or cystic degeneration of the chorionic villi and placenta and complete absorption of the fetus.

The patient was returned to bed where another milder hemorrhage took place and from this time on made an uneventful recovery.

The outstanding features of this case, aside from its being a rare disease, are that while the usual diagnostic symptom (unusual rapidity of growth of the tumor) was present the prominent symptoms were the severe nausea and vomiting and marked vertigo which in themselves at best are only relatively valuable in diagnosis, because they are reflex symptoms, yet they were sufficient to lead us to the conclusion that we were not dealing with a normal pregnancy in a woman who had nine children without any such symptoms previously. Otherwise the case was typical.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS.

MENTAL TESTS FOR RECRUITS.

In an excellent paper, "Some aspects of normality; with special reference to the selection of recruits," which appeared in the British Medical Journal of November 17, 1923, Lieut. Col. C. R. Sylvester-Bradley, R. A. M. C., when considering the subject of psychological normality, pointed out the well-known fact that the "frightfulness" of modern warfare, and the likelihood of this "frightfulness" increasing in the future, makes it imperative that those who are psychologically abnormal, those individuals liable to break down from functional nervous diseases should be eliminated from the military service as recruits and not as trained fighting men.

"It has been stated that over 20 per cent of all the soldiers discharged for disability from the British Army during the great war had one or another of the disorders grouped under the term 'shell shock,' 'neurasthenia,' or 'war neurosis.'

"The evil, however, is not limited to the number of inefficients and to the waste of money in training men who break down from this cause. The danger of enlisting such cases is in their power to spread their inefficiency amongst others, resulting in hysterical mass movement, loss of morale, and possibly panic.

"A large number of men who break down under the nervous strain of warfare do so from a fear of the unknown. Modern war methods, such as airplane bombing, gas, tanks, etc., are not conditions to which the average individual has become inured. A gas attack involving the same number of daily casualties as occurred in our last influenza epidemic would, without any doubt, have caused a panic amongst the civil population. It is in this connection that the soldier's training is so useful. While at his training he should be familiarized with the weapons and noises of modern warfare, so that the unknown quantity of their frighfulness is eliminated.

"There is nevertheless a large proportion of individuals in whom a nervous instability is either inherent or the result of incipient disability, and it is with regard to these cases that every effort should be made to eliminate them from the fighting forces. The most suitable place for this to be done is at the training depot, where, by watching the behavior characteristic of the recruits in conjunction with their physiological response to improved environment and training, and their ability to receive instruction, a very useful guide as to

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the recruits' psychology may be obtained, but at the same time much may be done at the recruiting depot to eliminate those who are mentally deficient or nervously unstable.

"The mental tests devised by Binet provide a very useful basis for standardizing the degree of mental efficiency necessary for a recruit on enlistment, and also for classifying recruits according to their mental capacity; it is not possible, however, to adopt a classification of this nature in a voluntary army, but it is quite feasible to introduce a minimum standard of mental capacity below which no recruit will be enlisted. Such a mental test should aim at arriving at the normal mental capacity of the general population, which, in all probability, is not more than a 12 to 14 year mental age, according to the Binet-Simon method.

"The objection to mental tests is that the results are of little value in inexperienced hands, and should be carried out, if possible, by psychological experts. Recruits who are liable to break down from war neurosis are frequently suffering from some incipient disease, also they may present signs of some physiological derangement, such as exaggerated reflexes, functional heart trouble, etc., which indicates the importance of the standards of physiological normality mentioned above."

In an appendix to his paper, Colonel Sylvester Bradley gives the following list of mental tests suitable for recruiting purposes. These have been selected mostly from "The Measurement of Intelligence," by Terman, and have proved of some help in actual practice at the Central London recruiting depot:

Test No. 1.—Ball and Field Test.

"Procedure: Let us suppose that your cricket ball has been lost in this round field. You have no idea what part of the field it is in. You don't know what direction it came from, how it got there, or with what force it came. All you know is that the ball is lost somewhere in the field. Now take this pencil and mark out a path to show me how you would hunt for the ball so as to be sure not to miss it. Begin at the gate and show me what path you would take.

Test No. 2.

"Repeat 5 digits backwards (1 of 3. Read 1 per second).

3-1-8-7-9 ---------- 6-9-4-8-2 ---------- 5-2-9-6-1

"Procedure: Listen carefully. I am going to read some numbers to you, but I want you to say them backwards. For example, if I should say 1, 2, 3 you would say 3, 2, 1. Do you understand? Ready, now; listen carefully, and be sure to say the numbers backwards.

(Marking: One out of 3 passes.)

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Test No. 3.—Clock Test.

"Clock (2 of 3. Error must not exceed 3 or 4 minutes).

6.22----------Time required----------
8.10----------Time required----------
2.46----------Time required----------

"Procedure: Suppose it is 6.22 o'clock—that is, 22 minutes after 6. Can you see in your mind where the large hand would be, and where the small hand would be?

"Now suppose the two hands to change places, so that the large hand takes the place where the small hand was, and the small hand takes the place where the large hand was. What time would it be then?

"Scoring: Two or three problems must be solved within following range of accuracy: 4.30–4.35, 1.40–1.45, 9.10–9.15.

Test No. 4.

"Procedure: Listen carefully. I want you to imagine that you are with a companion, drifting in an open boat, at sea.

"When you start your journey you had two buckets full of fresh water.

"The first day you drank the water contained in one bucket.

"The next day your companion set fire to his clothes whilst lighting a cigarette. What are you going to do?

"Fails if he throws the bucket of fresh water over his companion. Passes if he pushes him into the sea. Full marks if he fills empty bucket with sea water and uses that.

Test No. 5.

"If a lad's wage is 20s. a week and he spends 14s. a week, how long will it take him to save 300s.?

"If 2 pencils cost 5 pence, how many pencils can you buy for 50 pence?

"At 15 pence a yard, how much will 7 feet of cloth cost?

"(Score: Should pass 2 out of 3, allowing a minute to each problem.)

Test No. 6.

"Repeat 28 syllables (1 of 2 absolutely correct.)

"(*a*) Walter likes very much to go on visits to his grandmother, because she always tells him many funny stories.

"(*b*) Yesterday I saw a pretty little dog in the street. It had curly brown hair, short legs, and a long tail.

83393—24——4

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Procedure: I am going to read a sentence to you. Listen carefully, as I want you to repeat it to me without a single change of any sort.

"(Marking: Pass if one sentence is repeated without a single error.)"

FISH POISONS.

Very little is known as to the poisons contained in or excreted by fish, although naval medical officers frequently witness their effects. Dr. H. Muir Evans, of Lowestoft, has for some years been engaged in investigating the nature of the defensive venoms of fish. According to the Lancet of December 8, 1923, his most recent study on the defensive spines of fish and the glandular structure in connection with them, with observations on the nature of fish venoms, published in a recent issue of the Philosophical Transactions of the Royal Society of London, is largely concerned with the action of the venoms of *Trachinus draco* (the greater weever) and *Acanthias vulgaris* (the spring dogfish).

Doctor Evans has supplemented his laboratory investigations with the clinical research for which a fishing port like Lowestoft provides ample opportunities, and he had come to the conclusion that the venom of *Trachinus draco* has both a neurotoxic and hemolytic action, the latter characteristic being the most important. The pain of a weever sting is of a burning, stabbing character and may be very severe. Fishermen have told Doctor Evans that if a live weever is thrown overboard and is seized by a gull, the bird is stung by the fish and it falls into the sea as if struck dead. A rare complication is the appearance of hemorrhagic patches. If the sting is not treated, the pain may last for hours or throughout the day, and on account of the importance of poisoning by fish venoms among fishermen at sea Doctor Evans is of the opinion that fishing vessels should be obliged to carry a simple outfit for the treatment of such cases. The most useful method is to inject into the puncture a few minims of a 5 per cent solution of permanganate of potash, and a simple outfit, consisting of a small glass hypodermic syringe, rustless needles, and some small ampules containing a solution of permanganate of potash, would cost little and might prevent much suffering. Two patients treated by Doctor Evans in this manner obtained immediate relief from the pain, and there was no subsequent inflammation or gangrene. "It would be interesting to learn," says the Lancet, "if the fish venom introduced into the human body parentally by a stab has any connection with the symptoms of poisoning induced by eating certain fish. There is a possibility that in both forms of poisoning the suprarenals may be involved, and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in this connection it is instructive to note that a Danish physician has recently recorded two cases of severe asthma following a large meal of uncooked mussels. In both cases the most distressing dyspena was associated with cutaneous phenomena—a scarlatiniform rash in one case and severe itching in the other. In both cases the hypodermic injection of a little adrenalin had a most dramatic effect, normal respiration being restored within two minutes.

"The pathological action of venoms will probably be unraveled by observations on the lower forms of animal life. Mussel poisoning may give rise to various clinical types—an exanthematous type, with itching and a rash, a gastrointestinal type, and a paralytic type. In 1907 Richet obtained from the mussel (*Mytilus edilis*) a toxic substance analogous to the actino-congestine which he had previously extracted from sea anemones. Mytilo-congestine causes diarrhea, vomiting, prostration, and, most significant of all, a fall of the arterial blood pressure. The necropsy shows intense hemorrhagic congestion of the mucous membranes. Actino-congestine produces a similar clinical picture. Closely allied to the latter venom is meduso-congestine obtained from the jellyfish (*Rhizostoma cuvieri*), which causes local irritation and edema, and in some cases intense dyspnea, prostration, and severe diarrhea in rabbits and guinea pigs. The postmortem findings include edema of the lungs, visceral hemorrhages, and congestion of the liver, kidneys, and intestine. But the most significant lesions are those of the suprarenal capsules which are engorged with dark blood. It is interesting to note that the venom of the weever also causes intense visceral congestion and internal hemorrhages. It is probable that the dried venom of the jellyfish is responsible for the frequent attacks of intense coryza and even asthma observed among the men when nets are mended after the summer fishing. These are but a few of the many points of great interest raised by the researches of Doctor Evans and others, and it is to be hoped that future investigations will add much to what we already know of a fascinating subject."

AN EIGHTEENTH CENTURY COUNTRY PRACTICE.

Through the courtesy of a Mr. C. F. Harriss, a solicitor of Newport, Shropshire, England, a writer in the British Medical Journal of November 17, 1923, was able to examine the professional ledgers of an eighteenth century medical practitioner, William Coyne, of Holywell, Flintshire, Wales, and his account of these old books affords an interesting peep at country practice in that region over 150 years ago.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"These leather-bound volumes, three in number, are of uniform size and cover a period of more than a quarter of a century; the earliest entries refer to the beginning of the year 1746 (O. S. 1745), and the last are dated December, 1773. All that Mr. Harriss can say about the books is that he found them when clearing out one of the attics of his office, where he has every reason to suppose they had lain for over a hundred years. The firm of solicitors of which he is now the head dates back to the eighteenth century, and the distance from Newport to Holywell across the Welsh border is not great.

"In shape and size the ledgers correspond with a country doctor's daybook of the present day; the pages are faintly ruled for the dates, and for pounds, shillings, and pence; the entries are in several handwritings of varying legibility. Mr. William Coyne was evidently a country apothecary in a good way, and, like so many of his contemporaries, he not only compounded and supplied drugs, but prescribed remedies and visited patients. Occasional entries show that he dressed wounds and set fractures; records of venesection ("V. S. in brach. 1s.") are fairly frequent; of midwifery practice there is no trace. The records make it plain that, though sparing in phlebotomy, he drugged his patients as copiously and as often as any practitioner of the time.

"The ledgers form a straightforward record of things supplied and charged for, with little or no comment, and scarcely any touches which reveal anything of the man himself. The various accounts are arranged under the name of the householder or that of the individual patient. Many of these were persons in humble circumstances—gardeners, joiners, miners, and such like—but the practice would nowadays be described as 'mixed.' The more prosperous patients included members of the landed gentry, a merchant or two, 'Mrs. Jones next door,' several 'officers,' many farmers, and the local exciseman; grocers and butchers and publicans, a perruquemaker, and, in short, every kind of tradesman, large or small; together with the local attorney and schoolmaster, and other professional men.

"The mainstay of the practice was the head of the house of Mostyn. As is seemly, the first folio of the first volume opens with the record of William Coyne's enormously long account with Sir Thomas Mostyn, of Mostyn, and his successor in the baronetcy. During the 28 years covered by the ledgers, many of Coyne's patients were members of the Mostyn family, who are prominent in the district to this day. Thus, the eleventh baronet, Sir Pyers Mostyn, has a seat in Flintshire, and Lord Mostyn, the third baron, owns Mostyn Hall, Holywell. Sir Thomas, and after him Sir Roger, were a considerable source of revenue to Mr. Coyne; scarcely a week passed without several items being charged to the baronet's house-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

hold account. The usual fee for a journey to Gloddeth was 1 guinea, and 5 shillings to Mostyn Hall. In addition to this visiting fee, the baronet was debited with various amounts for medicines supplied on the same day to any members of the family or of the retinue or of the livestock who happened to be ailing at the time. Thus on one very moderate afternoon Master Daniel, Master Tommy, and Miss Mostyn (who was bled as well) all needed doses of Pulv. Alterat.; Betty, the housemaid, had Haust. Purg.; and Flor. Sulphur. and Bol. Armen. were prescribed for occupants of the stable. The household was large and the outdoor servants and other retainers numerous. Mr. Coyne's patients among the indoor staff included the housekeeper and the cook, footmen, housemaids, laundry maids, dairymaids, kitchen-maids, and turnspits, together with the Rev. Mr. Edwards, the domestic chaplain; Mr. Lloyd, the steward; and Mrs. Trim, the nurse. The outdoor staff included gamekeepers, grooms, coachmen, ploughmen, postillions, husbandmen, poultry women, cowmen, carters, and stable boys. Besides these, Sir Thomas Mostyn made himself responsible for medical attendance upon unidentifiable persons such as Mr. Wynne and Mr. Blundell, who may have been visitors or perhaps resident librarians, and upon ancient retainers described as 'Old Ellis,' 'Old Richard,' 'Old Mostyn,' and the like. The account was discharged in lump sums at odd times by the house steward.

"Another long account, which drags on from folio to folio in the third volume, is that for visits and medicines to the household of Lord Grosvenor at Halkin. Some loose sheets of paper, preserved with the ledgers, include a stained and blotted fragment from the daybook of 1757; also a list of Mr. Coyne's principal patients in the year 1769, together with the sums due to him from each. On this appears the names of Lord Grosvenor, Sir Roger Mostyn, Bt., the Dowager Lady Mostyn, Sir Watkin Williams Wynne, Bt., and a considerable sprinkling of the clergy.

"Looking through the ledgers we find entered up under the various patient's names innumerable pills, juleps, electuaries, mixtures, drafts, powders, boluses, drops, infusions, decoctions, linctuses, apozems, elixirs, and stomachic tinctures; also outward applications—plasters, balsams, liniments, embrocations, blisters, dressings; and, every now and then, the administration of a clyster. Manna was often supplied, presumably for the nursery. The endless tale of dull medicaments is relieved by occasional items such as 'Fruct. limon. ii, 4d.,' 'Six large bladders,' 'A bottle of bitters, 4s.,' 'Best gold leaf, 2 books, 3s. 6d.' In Widow Morrell's account 'a quire of writing paper, 6d.' appears several times; and, stranger still, Edward Roberts, Esq., of Denbigh, is debited with a silk plaid waistcoat at £2 2s.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"Mr. Coyne's surgical practice was not extensive. It was confined for the most part to emergencies, such as the reduction of fractures and dislocations, and attention to injuries. At rare intervals we find records of minor operations; for example, 'opening ye sinus and dressing,' 'opening a tumor in his groin,' 'scarifying,' 'amputat. digit. and cure.'

"An astonishing account is that of Miss Salisbury. It opens in the third volume under date November 18, 1769, and continues through 15 folios, each containing 50 or more separate entries. The last item is dated June 10, 1771, but the record, though broken at that point, was continued in another volume, lost long since. Between those two dates, some 18 months apart, never a week passed and seldom a day, without Miss Salisbury receiving a draft or some aromatic spirits or a bottle of Bristol water from the attentive Mr. Coyne. She paid him £58 odd on February 23, 1771, and owed about £15 when the account passed into the new ledger.

"One of the folios contains 'an account of what goods came in for the year 1771.' From this it appears that Mr. Coyne's stock-in-trade was mainly replenished from two sources—Mr. Wilson, druggist of Chester, and Mr. Ellams, druggist of the same city. Goods to the value of £4 11s. 3d. were bought from the former, including 4 shillings' worth of corks and half a guinea's worth of gallipots. Mr. Ellams's account was larger—nearly £14. Phials costing £1 17s. 2d. were purchased from Mr. Seamen of Warrington, and supplies of 'selter' water and other unnamed commodities came from a Mr. Hegg. On April 29, 47 pounds of butter were bought for a guinea.

"Before concluding this note it should be mentioned, perhaps, that Mr. Coyne was very lenient in his charges to the clergy for professional services and medicines. One parson's bill, containing 23 items, amounted to no more than 11s. 3d., and another was charged nothing at all. Professional colleagues (Doctor Parry of Caerwys, and Mr. Blount, a neighboring apothecary) were treated with the same consideration; sometimes a small charge was made for drugs supplied, but more often nothing. The third ledger closes sententiously with a Latin tag, written in a large copperplate hand on the inside of the cover:

"*Sic transit gloria mundi.*"

MEDICAL EXPEDITION TO THE SOUTH SEAS.

A preliminary report by Dr. Francis W. O'Connor of the results of the expedition sent from the London School of Tropical Medicine to the Ellice, Tokelau, and Samoan Islands in 1921–22 was published in the Transactions of the Royal Society of Tropical

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Medicine and Hygiene. According to the Tropical Diseases Bulletin of November, 1923, "the author was engaged for 17 months in actual scientific investigation, during which he surveyed 20 islands in the Samoan, Tokelau, and Ellice groups. The geography, topography and climate of these are described. Thus the Samoan group consists of eight (four are American) inhabited islands of volcanic origin, of which Savaii reaches an elevation of 4,000 feet; the Samoans live on the low-lying coast country close to streams and plantations. The Tokelau and Ellice groups are atolls and not more than 20 feet above sea level. The customs and habits of the islanders are considered. The diseases prevalent are ankylostomiasis, filariasis, yaws, tuberculosis, and skin affections, especially Tinea imbricata. In Samoa eye diseases are common and leprosy is not rare. In the southern Ellice fish poisoning occurs.

"The author first makes some general observations on the three groups and then treats each individually. Of the general blood picture it may be said that the leucocyte count is usually higher in natives than in Europeans, counts of 9,000 to 10,000 being common. The eosinophile count was usually above normal and averaged 20 in three children of five and under whose only parasite was Trichuris; observations of Europeans showed that filariasis alone can raise the percentage. Considering the heavy weight of hookworm infection the hemoglobin percentage was not remarkably low.

"Filariasis.—Epidemiological and experimental evidence confirmed *Stegomyia pseudoscutellaris* as the intermediate host (Bahr, Fiji, 1910). Thus in the Tokelaus, where filariasis is indigenous, this is the only mosquito, and elsewhere the incidence of filaria increased with that of *S. pseudoscutellaris*. Mosquitoes of this species hatched from larvæ and fed on filariated subjects were found after an interval to contain fully developed larvæ in head and proboscis, and similar findings are recorded in seven specimens of 100 caught wild. An account is given of the development in the mosquito. It bites by day and breeds in fresh water containing decaying vegetable matter—in husks and shells of coconuts, holes in trees whether artificial or natural, bottles and tins, depressions in the larval rock (Samoa), cocoa pods which have been excavated by a rat. Measures for its control would not be difficult; indeed the author suppressed it in one islet in two days.

"Observations on the microfilaria, which is nonperiodic, are given. The author found (*a*) that microfilarial incidence is in direct relation to the prevalence of *S. pseudoscutellaris*, (*b*) that the incidence of clinical filariasis is in direct relation to the microfilarial incidence, and (*c*) that elephantiasis is usually prevalent where clinical filariasis is greatest. Children below the age of 4 rarely show undoubted signs of filarial infection. The author's observations

Digitized by Google Original from UNIVERSITY OF MICHIGAN

support the opinion generally held that elephantiasis is a manifestation of filarial infection.

"The clinical signs of filariasis are discussed and especially the early signs, for Doctor O'Connor's assistant, Mr. C. E. Berry, became accidentally infected. Two days after the infective bites (in April) several hard, brawny, extremely itchy bites, each about the size of a shilling, were noted; on the forty-third day the epitrochlear gland was swollen and tender and was removed on the seventy-first; on the one hundred and fifty-sixth day there was a severe attack of lymphangitis lasting a fortnight, beginning with pain and swelling of the axillary glands; on November 11 the eosinophile count was 12 per cent; on the two hundred and fifty-fourth day there was tenderness and slight swelling of the epididymis; on March 1 the eosinophile count was 16 per cent. These are the salient features of the case. The removed gland showed hemorrhages and large clusters of eosinophiles; no worms.

"Cases (one to six in each instance) were treated with salvarsan, novarsenobillon, galyl, kharsivan, tartar emetic, stibenyl, collosols of copper, selenium and manganese, quinine hydrochloride and emetine—without effect on the microfilariæ. Symptoms were sometimes mitigated by the bodily rest.

"*Other diseases.*—Of helminths three species of hookworm were found, *Necator americanus* being the commonest; *Ascaris lumbricoides* (in Samoa) and *Trichuris trichiura;* no cestodes or trematodes. Ankylostomiasis is serious. 'Ova were found in every case of filariasis brought in for treatment'; over 90 per cent must be infected. Latrines staged over the sea is the obvious preventive. Tuberculosis, 'the scourge of the Pacific,' is prevalent in every island. In young children fatal tuberculous peritonitis is very common, in older children tuberculous neck glands, and in adults phthisis. The customs of the people lead to the simultaneous infection of entire families. Yaws is common—manifested by cracked feet, granulomata, onychia; in a few instances deformity of the tibia. Juxtaarticular swellings with past history of yaws occurred in all the islands. Gonorrhea was not observed, and syphilis, 'if it exists at all, can not be common.'

"Particular aspects of disease in each group are next considered and must be dealt with briefly. The filarial incidence for each island was worked out and correlated with the incidence of the Stegomyia. In the Ellice, of 1,169 persons above 16 years 716, or 61.2 per cent, showed evidence of infection, either microfilarial or clinical (including elephantiasis); of the last 120 cases were seen. The absence of ascariasis in this group is attributed to the sweet husk of a coconut which the Ellicians are accustomed to chew; two infested Samoans

Digitized by Google Original from UNIVERSITY OF MICHIGAN

lost their worms after several months in the Ellice. Ankylostomiasis affects probably 100 per cent of adults, and to this in part is attributed the appalling susceptibility to tuberculosis. The whip-worm is extremely common. Cysts of *E. histolytica* were found in 1.3 per cent of 225 examined, but there is no tradition of amebic dysentery. Balantidium was found neither in man nor pig in this group, possibly again due to the coconut. Interesting information is given about fish poisoning on some of the southern atolls; rock-haunting fishes of certain species taken in a particular locality are toxic to the eater, but there was no opportunity to verify the native statements.

"In the Tokelau group the inhabited islets are so small that they are completely cultivated and no cover is left for mosquitoes; the uninhabited islets sheltered the Stegomyia. The filarial incidence was 36.7 per cent (330 examined). Details are furnished for 3 islets. No case of elephantiasis was seen or reported.

"In Samoa of 2,509 persons past their sixteenth year 1,463, or 58.3 per cent, showed evidence of filarial infestation; 115 cases of elephantiasis were seen. Enlarged epitrochlean glands were found in a large proportion of children in two schools. The ankylostome percentage was 85.1. *E. histolytica* was found in 9.6 per cent (229 examined); 2 cases of amebic dysentery were seen in Chinese. Three epidemics of Samoan conjunctivitis occurred during the author's stay; in default of proper treatment it is followed by ulceration of the cornea; it resembles gonorrheal opthalmia and Leber has described a diplococcus as the cause. Gonorrhea seems to be excessively rare."

HOW TO USE A REFRIGERATOR.

There are several important points regarding the operation of a refrigerator which should be observed if one is to get efficient service from it. The Modern Hospital of December, 1923, summarizes the principles governing the care of this useful adjunct to the sick quarters.

"The first thing of importance is to see that the refrigerator is properly located. Refrigerators should be placed in a dry, cool, well-ventilated room. Damp cellars and locations near a range or exposed to the direct rays of the sun, should be avoided. Small pantries and rooms without adequate ventilation are also not desirable locations. The ideal place is a dry, cool room in which there is a good circulation of air.

"It is important too, that the foods are stored properly—that is, placed in the proper position to be kept fresh and wholesome and not to absorb odors from each other. For instance, in modern, well-designed refrigerators there is always a constant circulation of air,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the cold air falling down from the ice chamber to the lower compartments, then rising through the storage compartment and finally finding its way back to the ice chamber at the top. This means that the coldest part of the refrigerator is below, and especially immediately beneath the ice chamber. Therefore milk, butter, fresh meats, and similar foods should be stored in these lower shelves. Vegetables and fruits may be kept near the top, and it is especially important that any foods having a very decided odor should be kept at the top. These odors are then carried immediately into the ice chamber, condensed on the ice and discharged through the drain pipes. This is assurance that foreign flavors will not be imparted to the remainder of the food.

"Upon being placed in service, a new refrigerator should be iced and allowed to stand with the storage doors open for some time.

"It is a fact that a good many people overlook that the refrigerator will operate most economically if the ice chamber is kept full or as nearly full as possible at all times. This means that the entire refrigerator is kept thoroughly cool, and at the same time the ice doesn't have to melt so rapidly in order to maintain the proper temperature. It is better therefore to put in some ice each day rather than to permit the ice chamber to become nearly empty before refilling. There will be a big difference in the ice bills.

"Before the ice is placed in the refrigerator it should be carefully washed, for dirt, sawdust, and other particles which cling to it are a source of odor and taint and also cause clogging of the drain pipe and trap. Needless to say, the interior of the refrigerator should be cleansed regularly; the drain pipe and trap especially should be taken out and cleaned at least once a month and preferably oftener.

"Although it seems that everyone should realize this, it bears repeating that for an efficient operation of a refrigerator all doors should be kept tightly closed. When they are allowed to remain open longer than absolutely necessary to remove or replace food, this not only permits the cold air to escape, but the warm outside air in coming in contact with the cold surface of the interior of the refrigerator condenses, causing the door and door frames to swell.

"The shelves of the refrigerator should never be covered with cloth or paper, for this prevents proper circulation of cold air through the refrigerator. If these simple instructions are observed and the refrigerator is scientifically and staunchly built, there is every reason to expect satisfactory service."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ANAPHYLACTIC REACTION FROM TYPHOID PROPHYLAXIS.

The following case is reported by Lieut. Commander J. C. Parham, Medical Corps, United States Navy, in view of the very alarming nature of the patient's symptoms. The patient, Lieutenant I, had received two series of antityphoid inoculations, one in 1915 and the other in 1919. On each of these occasions he had a severe reaction following the injection, but never one approaching the severity of the reaction now reported.

Lieutenant I received his second injection of triple typhoid vaccine at 10 a. m. December 5, 1923, the usual dose of 1 c. c. being given. The first injection of the series had been given on November 28, 1923, without marked reaction. One hour after the second injection he began to have slight rigors. When seen by the medical officer at noon he was noticeably very ill. He was markedly cyanotic and his conjunctivæ greatly injected—almost purple. The pulse was 100, weak and rapid; respiration 30; skin cold, and patient having a hard chill. He was immediately put to bed and given 1 c. c. of adrenalin chloride hypodermically. External heat was applied. At 12.20 p. m. he vomited, the vomitus containing about 60 c. c. of fresh blood. He vomited again at 12.30 and at 1 p. m., each time bringing up about 30 c. c. of blood. At 12.45 p. m. the findings were as follows: Pulse, 80; respiration, 24; temperature, 103.8; patient very quiet. A hypo of morphine sulphate grain 1/4 and atropine sulphate grain 1/150 was given to control the vomiting. The patient's color began to improve shortly after the administration of adrenalin and coincidently all alarming symptoms disappeared. Subsequent treatment was entirely symptomatic, fluids to flavor elimination, heat for the chill, etc. The temperature rose steadily until 2 p. m., when it registered 104.2. Pulse was 108 and respiration 36, the high pulse and respiration rates being doubtless due to the temperature. From 2 p. m. on, the temperature slowly declined. The patient passed a fairly comfortable night, and on December 6 was much better.

The antityphoid vaccine used in this case was of the regular issue and approximately 10 injections from the same lot had been given without unfavorable reactions.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS.

RELATION OF THE DIETETIC DEPARTMENT TO THE MEDICAL SERVICE OF A HOSPITAL.

At a meeting of the Ohio Dietetic Association held last May, Dr. C. D. Christie, of Cleveland, delivered an address on this subject, which appears in The Modern Hospital of November, 1923. In this address he discussed nutrition in a general way, showed how vital its fundamental principles are in the treatment and management of sick people, pointed out its intimate bearing upon society both from an economic and a medical point of view, and impressed upon the dietitians gathered to hear him the facts that the scope of their work is in a certain sense unlimited, that the surface of the subject of nutrition has scarcely been scratched, and that to keep pace with this rapidly developing science higher and higher standards must be demanded for those who take up the profession.

The following excerpts from this address should be of interest to the Navy nurse:

Nutrition has advanced for the most part hand in hand with chemistry and physiology. These two sciences have given us the clew to a fuller understanding of the constituents of foodstuffs and the changes during digestion, and finally some slight appreciation of the wondrous secrets of the metabolic processes. Our knowledge of the component parts of foodstuffs has advanced far, and most of our conceptions of the actions of body secretions upon foodstuffs during digestion are probably in the main correct; but from the time that digestion is complete and the end products of digestion—namely, amino acids, glucose, fatty acids, salt, water, and vitamins—are absorbed into the blood stream, our information concerning the subsequent disposal of them to maintain the balance which we term metabolism is exceedingly sketchy.

What takes place in the body when these component parts of the food we eat meet in the blood stream with the oxygen which we breathe? How does the heart get its proper supply, and how does the brain get its share? What is the mechanism which determines what proportion of amino acids taken from those floating in the blood shall go to supply the needs of the brain? There are many kinds of amino acid formed in our intestines after each meal, though some foods are deficient in certain kinds; and as far as we know the

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

body needs all of them, each being a different and distinct entity. Then by what rule do we supply these particular substances to our body, and how do we known we are supplying the food which contains the right kind? One might carry this series of questions on indefinitely, showing how totally lacking we are in certain fundamental information along nutritional lines.

For several years development in nutritional studies as related to treatment and prevention of disease has advanced very fast. This has been particularly true of the so-called deficiency diseases such as beriberi, scurvy, pellagra, etc. These advances have been made by means of relatively simple experiments. From now on the results in these lines will come more slowly, as experimentation will be more difficult. These deficiency diseases are due to the absence of certain vitamins from the foodstuff, and feeding experiments with small animals were sufficient to detect them. Pathological conditions in the human body due to deficiency or superabundance of certain amino acids or particular salts are bound to be slower in detection. The physico-chemical pathologist must first describe the lesion in the cells; the medical man must recognize these lesions on patients; and the physical chemist must tell us what is wrong. It is conceded by scientific men that, by advancing our knowledge along these fundamental nutritional lines, there is great hope for the building up of a physically more perfect race with bodies more capable of resisting disease.

One might cite the experiments of Mr. Babcock and others at the Wisconsin experiment station as evidence pointing in this direction. In a series of pregnant cows, some were fed wholly upon a diet of corn, others on wheat, others on oats, and still others on a mixed diet of wheat, oats, and corn. They were all handled in exactly the same way and were not allowed any other food. It is a very significant thing that those which lived entirely on corn carried their young until term and gave birth to calves which were large, hardy, and strong. In the wheat-fed ones, the calves were born several weeks too soon and were in most instances either born dead or died a few days afterwards, and they weighed about half as much as the calves of the corn-fed mothers. The cows themselves kept about equal in weight, but the corn-fed ones were sleek and strong, while the wheat-fed ones were gaunt and rough haired. The oat-fed ones stood between. These are significant facts. What is the explanation?

We have chosen the food upon which we live by the rankest kind of empiricism. Our ancestors lived in a narrow sphere; they chose the food which was closest at hand, that which grew on a neighboring vine or bush. As time went on they planted and cultivated that which caused the least exertion and gave the greatest yield. There was no particular thought as to what was good for them, unless per-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

haps something caused sudden acute sickness. Slow disastrous effects were overlooked, as they are doubtless in many instances overlooked by us to-day. Our eating is, then, largely determined by the habits of our ancestors.

This hereditary lack of dietary wisdom is seen in the obese, and we have much evidence that obesity is a serious condition. It is a common experience that an obese person does not stand a severe illness well. Life insurance companies look with far more suspicion on the man who is 25 per cent overweight than they do on the man who happens to be the same amount underweight, providing that both are normal in other respects. It is common knowledge that nearly all diabetics are recruited from the fat. People past 40 years of age and overweight supply us with the great majority of instances of high blood pressure, and therefore many premature deaths.

However, it seems rational to suppose that the majority of instances of obesity are preventable, but the eradication of the condition after it is well developed is not so easy. The type of civilization which we are now fostering predisposes to obesity. The two main factors in its production are sedetary habits, which are encouraged by electrical appliances and the automobiles, and the excessive consumption of carbohydrate food as bread and sweets. During the last several years the per capita sugar consumption in America has gone up by leaps and bounds, and so has the waist line. The chief statistician of a large life insurance company has recently made the observation that the frequency of constitutional diseases in general increases as age advances, but that diabetes is an exception to the rule, in that its incidence increases with age only with the fat, while in the thin it remains constant throughout life.

There is gradually accumulating evidence to show that extensive nutritional studies are necessary to explain certain pathological conditions among people in various parts of the world. I am firmly convinced that something in our dietary is wrong. Among the Japanese diabetes is practically unknown, and so is obesity. May this fact not be due to some perfectly simple dietary fault which we have lugged along with us generation after generation? After all, our eating and craving for certain foods are habits. The sweets of which we think so highly would be spat out by an Eskimo if he happened to get some of them into his mouth. The Eskimo is able to eat a meal almost solely of protein and fat and then lie down in the snow and sleep for hours without dire consequences. This fact is usually explained as owing to a specific dynamic action of the protein and fat in elevating metabolism and therefore heat production. But may not the superabundance of protein and fat in his food contribute to a human mechanism which is more sturdy and therefore resistant to bacterial invasion?

Digitized by Google Original from UNIVERSITY OF MICHIGAN

There is some evidence that decaying of teeth may be explained on a dietary basis. The mere fact that teeth decay may not of itself be of great importance, but it may be associated with a deficiency which is clearly of importance, if diseased conditions are to be resisted. One can also cite the prevalence of goiters in certain districts as probably owing to dietary deficiency. These are all important questions. They must be answered, and the world looks to those engaged in nutritional medicine to give the answer.

Scientific men who are devoting their efforts to this line of study need dietitians. Well trained dietitians are an absolute essential to the continuation of this kind of work. I venture the prophecy here that the next 10 years will see more rapid strides in this field of medicine than in any other. The bacteriologist is not likely to give us anything very startling as far as the explanation of certain diseases is concerned. The histological pathologist and the surgeon are also essentially in the position of stalemate so far as any light shed from their point of view. The answer will come to many of these vital questions through the development and extension of nutritional studies. Lusk said in 1917, "In another decade the development of scientific knowledge will probably permit the formulation of the subject from the standpoint of physical chemistry. It can not now be so treated." I can only venture the guess that it will not be so long.

Up to this point I have tried to point out the direction that nutritional studies are taking. So far I have said very little about those facts of nutrition which are well understood. Already the work which a well trained and well organized dietetic department is able to do in a hospital or a community is indispensable. It is not the physician's work any more than is the nursing care of the patient the duty of the physician. However, without well trained physicians a nurse's services would be extremely limited. I hold that the sense is true of the dietitian. Her services are well-nigh useless unless they are intimately bound up with sensible medical direction. It is my impression that an efficient medical department in any hospital which is keeping abreast with the rapid developments in nutritional medicine can not operate to maximum efficiency without an equally well balanced dietetic department. Unfortunately, most of the diseased conditions where diet is an important factor are chronic conditions extending over months or years. In most cases treatment demands a complete reversal of the patient's mode of eating. He must be instructed along new lines.

Proper instruction in any new dietary régime entails not only explaining the fundamental principles by which the patient is to be guided, but set consultations and demonstrations. The day is past

Digitized by Google Original from UNIVERSITY OF MICHIGAN

when a physician, who expects results, can tell a patient to go home and not eat thus and so, or give him a printed slip and say this is what he is to eat. That way of doing it is not satisfactory because of several reasons. The first is that the patient eats everything on the slip the first week, tires on the second, and then eats what he likes. Those who understand the fundamental principles on which the diet is based can generally prepare an unlimited variety of food-stuff which will meet all the requirements of the stingy little slip of paper, and thus keep the patient satisfied and more nearly insure results. The physician who takes his patient through a month of gastric ulcer routine and stops there we now know is derelict in his management. Such patients must be treated for six months or a year on dietary measures. We can not hospitalize them for that long, and mostly we can not keep them idle for more than a month. Is the average well-trained physician going to take the time to instruct the patient in detail each few weeks as to what he can carry in his lunch basket which will meet the gastric ulcer requirements, and at the same time keep the patient contented and happy? Generally he will not.

We have well demonstrated in the out-patient department of the Lakeside Hospital that a large percentage of the chronic stomach complainers—I mean those who have little pathology but a high morbidity rate—are suffering from undernutrition with an accompanying gastroptosis. Many have brought it on themselves by unnecessary restriction of their food for one reason or another, many from inadequate convalescence after an illness. It is this class of patients from which the surgeon recruits the great majority of his unnecessary surgical operations. We see patients who have had one, two, three, and sometimes four abdominal operations and the same discomfort afterwards. We have taken them and have given our dietetic department carte blanche orders to build them up. In many instances the results have been perfectly brilliant.

No physician is going to take the time and not one in ten has the training to sit down and thrash this sort of thing out with the patient.

It is surprising how ignorant many well-educated people are in matters of food value. Many I am sure would tell you that a pound of lettuce is as efficient as a pound of navy beans. Such instances of ignorance make the question an important one from an economic point of view, and the information needed can be disseminated in a community by a well-organized dietetic department. What is true of gastric ulcer patients and those with gastroptosis holds notably true for a variety of other conditions. I need only mention diabetes, nephritis, obesity, etc. I personally have felt more and more

Digitized by Google Original from UNIVERSITY OF MICHIGAN

strongly that the dietetic staff of a hospital should be given better facilities for the conduct of their work. The information which they disseminate is vital to the normal as well as the sick. We have constantly tried to give the dietitians more duties and opportunities in our hospital and have, in most instances, felt that their work should be continued and extended.

A dietetic organization in a hospital need not interfere in any instance with the prerogatives of physicians, nurses, or social workers. In fact a capably organized dietetic department can be of as distinct service to the nurses and social workers as it is to the physician. It must, however, be given adequate facilities for consultations and demonstrations with patients.

In closing, let me briefly recapitulate the points which I have tried to bring out in this paper. The science of nutrition has progressed far during the past hundred years, but nutritional medicine has been built up in the main during the past 10 years. There are many diseased conditions now which can be satisfactorily treated only by dietary measures, and this number will gradually increase as nutritional medicine develops. This development may be slow, however, from this point on, as it entails the application of a new and fundamental science, namely, physical chemistry.

Nutritional medicine has developed sufficiently far to prove that it is possible to prevent certain diseased conditions which now yearly exact a great toll of human lives. I mean particularly obesity in its relation to diabetes and high blood pressure. Hospitals and physicians must appreciate these developments in nutritional medicine, and they must realize that it is possible to take advantage of them only through a well-trained dietetic department. Dietitians must appreciate the gradually increasing scope of their work and must constantly attempt to improve the educational standards of those who would take up the work. Furthermore, they must appreciate their twofold duty; first, to disseminate freely to the community knowledge which will lessen economic burdens because food will be of greater caloric value and therefore less will be required for the nutrition of a family, and because it will prevent certain diseases; and secondly, to form a link in the chain which is essential in the treatment of certain diseased conditions.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

BOOK NOTICES.

Publishers submitting books for review are requested to address them as follows:

The Editor,
U. S. Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.
For review.

Books received for review will be returned in the absence of directions to the contrary.

NUTRITION AND CLINICAL DIETETICS, by *H. S. Carter, M. A., M. D., assistant clinical professor of medicine, Columbia University, New York; P. E. Howe, M. A., Ph. D., associate, Rockefeller Institute for Medical Research, and H. A. Mason, A. B., M. D., associate in diseases of children, Columbia University.* Third edition. Lea and Febiger, Philadelphia, Pa., 1923.

In a few diseases, such as obesity, the indications for diet are clearly indicated and are largely a matter of rule, adherence to which will usually bring about the result desired, while in others the results can not always be foretold, as the foods which suit conditions in one individual will fail to produce the desired results in another, so that while the principles remain the same the individual requirements may be quite different. In such a disease as typhoid fever this is particularly true, and the best feeding results will be obtained by the physician who gives the most attention to details and uses the best judgment in the selection of foods both quantitatively and qualitatively.

In order to treat disease successfully the physician must possess a sound knowledge of the facts in the biochemistry of foods. These facts together with all that is of practical use in their clinical application have been incorporated in this book in a clear and readable form. The authors deal with the subject matter in four parts. In Part I foods and their relation to normal nutrition are considered.

A knowledge of the energy changes in the various conditions of life is fundamental to a satisfactory understanding and control of the diet, therefore, in this portion of the book, after a preliminary review of the processes of digestion, absorption, and execretion,

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the authors discuss the caloric value of foodstuffs and the energy requirements of the body.

Fisher first suggested as a unit for comparison the 100 caloric food portion or the weight of food which will supply 100 large calories. This unit is very useful in comparing not only the relative nutritive value of various foods but also their cost. The authors employ throughout the book this unit, the use of which facilitates the preparation of diets in which foods of the same type may be substituted one for another to avoid monotony. The proportions of protein, carbohydrate, and fat which furnish energy are expressed in terms of percentages, an arrangement which permits rapid calculations in the selection of a properly balanced diet.

Protein is an essential constituent of our daily dietary. Energy may be derived from protein, fat, and carbohydrates, but only protein or its products of hydrolysis can furnish the amino acids necessary to replace the loss of nitrogenous material in the tissues resulting from the general bodily functions or for the constructive processes of growth. In the third chapter the authors discuss the question of the quantity of protein necessary for the body, how it may be supplied, and the relative efficiency of various proteins for the needs of the body.

Our present knowledge of the vitamins is considered in a chapter together with the inorganic salts and water. A useful inclusion in this chapter is a table giving the relative distribution of vitamins A, B, and C in certain common food materials.

Food requirements in pregnancy and lactation and the food requirements and feeding of children, including the planning of children's meals and the food habits of children, are quite fully considered.

An interesting chapter is that devoted to normal feeding and food economics. The application of the principles of human nutrition to the feeding of the normal individual or to the family group is involved and more or less difficult. Though the scientists may determine and the physician prescribe an ideal dietary, its adoption by the patient may be quite impractical, due to cost, inconvenience, a lack of market facilities. But since foods are interchangeable within wide ranges, the authors give in this chapter a summary of the principles of nutrition which underlie the selection of food, together with some typical menus, and a discussion of the cost of foods in proportion to their food value, all of which is an aid in the interpretation and application of these principles.

In Part II foods per se are considered in detail. In the chapters composing this portion of the book foods are considered according to their composition in terms of foodstuffs, and the authors consider in detail the protein foods; fat foods; carbohydrate foods; and foods

Digitized by Google Original from UNIVERSITY OF MICHIGAN

valuable for their salts, water, or vitamins, such as fruits, condiments, and beverages. A discussion of foods classified in this manner not only emphasizes the principal use of the food but also aids in the search for foods that supply the elemental food factors. The authors' method of handling this subject differs from the usual method of considering only the origin of foods in that they recognize in their classification no distinction between vegetable and animal food. The dried legumes are placed with the protein-rich foods and certain animal products are placed with the fats. Milk, however, is difficult to classify under these circumstances. As it is the most complete food available, the authors have considered it in a chapter alone.

Part III is devoted to a consideration of feeding in infancy and childhood. It contains excellent chapters on breast feeding, artificial feeding, the feeding of the premature infant, feeding after the first year, feeding during acute illness and in nutritional disturbances.

The intelligent use of foods in disease is now a matter of interest, not only to the specialist but to the practitioner as well, therefore it is not surprising to note that the major portion of the volume (Pt. IV) is taken up by a consideration of feeding in disease which the reader will find especially useful in practice.

In the discussion of diet in organic cardiac disease one finds the details of the Karell diet and its modification as recommended by the late Dr. N. B. Potter for cardiac decompensation, and Cornwall's rules for diet in hypertension.

A consideration of feeding in pneumonia and in tuberculosis forms a prominent portion of the passages dealing with diseases of the lungs.

In the chapter on diet in diseases of the stomach, the diets found useful in hyperchlorhydria, gastric hypersecretion, gastric hypoacidity, acute and chronic gastritis are outlined and the dietetic treatment of peptic ulcer and gastric atony are given in detail. The various gastric test meals and gastric motor meals in common use are included in this chapter.

In diseases of the intestines diet plays a most important part, and in the chapter on this subject the reader will find the dietetic measures indicated.

Among other important chapters are those on diseases of the genitourinary system in which the various kidney dietary tests in use are outlined, together with the dietetic management of the nephritides; on diabetes in which the dietetic treatment discussed includes Van Noorden's method of treatment, Foster's system of carbohydrate units, and Allen's treatment; on obesity in which the various reduction dietaries are fully considered; on leanness in which

Digitized by Google Original from UNIVERSITY OF MICHIGAN

fattening diets are treated; on typhoid fever in which the high caloric diet devised by Warren Coleman is given.

The book contains a useful presentation of the artificial methods of feeding, and the special dietary cures which have been in vogue.

The volume closes with a chapter containing a table of food values based on the average chemical composition of American foods; tables of measures and weights; Fisher's table of 100 calories, which is a table of 100 calorie portions giving actual amount of protein, fat, and carbohydrate, and the percentage of calories in protein, fat, and carbohydrate in each portion; a table showing the nutritive value of the food materials calculated for the quantities commonly required in cooking small portions.

SURGERY OF THE SPINE AND EXTREMITIES, by *R. T. Taylor, B. A., M. D., F. A. C. S., professor of orthopedic surgery in the University of Maryland and College of Physicians and Surgeons, Baltimore, Md.* P. Blakiston's Son & Co., Philadelphia, Pa., 1923.

Orthopedic surgery as a specialty separated from general surgery is of comparatively recent date in America, for its first chair in a teaching institution dates from 1861, when the elder Sayre filled it at the old Bellevue Medical College in New York. However, before that time many surgeons in this country had contributed to our knowledge of the subject.

Nathan Smith of Yale (1762–1829), first used a trephine in osteomyelitis and introduced manipulative means to reduce dislocation of the hip joint. William C. Daniel, of Savannah, was the first to use extension by weight in the treatment of fracture of the femur. J. Kearney Rodgers (1793–1851) of New York did an osteotomy in ankylosis of the hip in 1840, but he had been preceded by John Rhea Barton (1794–1871) of Philadelphia, who first performed this operation in 1826.

Henry Jacob Bigelow (1816–1890) of Boston excised the first hip joint in this country in 1852 and published a "Manual of Orthopedic Surgery" in 1844.

Gurdon Buck (1870–1877) of New York popularized the treatment of fractures of the thigh by weight and pulley, which is now so much used in contractures, especially in muscle spasm in tuberculous disease of the spine, hip and knee joints, and known as "Buck's extension."

Robert A. Kinloch (1826–1891) of Charleston, S. C., who was medical director on the staff of Generals Lee, Pemberton, and Beauregard in the Civil War, first successfully in this country excised the knee for chronic disease.

Henry C. Davis devised the traction splint for tuberculous hip disease and the anterior-posterior support for Potts's disease.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Along with the introduction of anesthesia in 1846 and the introduction of antiseptic and aseptic surgery, orthopedic surgery partook of the general expansion of surgical practice and became more and more specialized and operative.

The first special institution for the crippled was advocated by James Knight of New York as early as 1842, but it was not until 1863, that the Hospital for the Ruptured and Crippled of New York City was finally incorporated. The New York Orthopedic Hospital was established in 1866. The Boston Children's Hospital was incorporated in 1869. The first orthopedic hospital south of Philadelphia, the Hospital for Crippled and Deformed Children, was established in Baltimore by the author of the volume under consideration in 1895.

In the early days of the specialty "orthopedic surgery was the surgery of deformities of children. It is now no longer applied to children only, but comprises all those cases where the bones, joints, muscles, tendons, ligaments, and nerves are detrimentally affected, even without deformity, yet which may present departures from normal function or alignment as an early or late manifestation of the trouble."

Formerly orthopedic practice was confined quite exclusively to the use of braces and splints, but with the introduction of aseptic surgery many clever operations have been devised to overcome disability to such an extent that often braces may be discarded. This operative tendency in orthopedic surgery puts the specialty on a high plane, as it not only promotes the nearest approach to exact cure and the greatest comfort to the patient but saves him from much needless and endless expense incident to prolonged treatment with apparatus.

The author of this volume has produced an excellent work in which he gives the reader the benefit of the experience derived from years of association with this special branch of surgery. In the book he covers the entire field of orthopedic surgery in a brief yet practical manner, making the volume especially suited to the needs of the student and general practitioner.

The first portion of the book is devoted to a discussion of orthopedic technique. In it the writer considers the preparation, indication for, and application of fixation dressings, and then devotes several short chapters to the treatment of muscle spasm, spinal extension, and fixation in bed by means of the Bradford frame.

There is an excellent chapter on the use of supporting and traction apparatus in which the Balkan frame is described and the principles governing its application explained.

Certain operative procedures such as tenoplasty, osteoclasis, osteotomy, and bone grafting are considered. Two useful chapters are those on the care and application of braces and surgical mensuration.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The second portion of the book deals with the spinal affections, tuberculous and nontuberculous.

In considering tuberculous lesions of the spine the author discusses the principles of treatment, namely, recumbency, traction, and fixation with the spine hyperextended at the point of disease, in a clear and readable manner, and he gives the operative treatment of Pott's disease as devised by Albee and by Hibbs, in sufficient detail for a proper understanding of these methods of producing ankylosis of the spine.

In the discussions on the abnormal spinal curvatures which are included in the chapters on the nontuberculous affections of the spine, one finds excellent preventive measures outlined. When these abnormal curvatures have developed the strengthening and restoration of the equilibrium in the osseous, ligamentous, and muscular elements of the trunk become important, and the author takes great pains to describe clearly the various gymnastic exercises and the various methods of mechanical correction which has been found successful.

The third portion of the volume deals with the various affections of the extremities.

A notable feature of the book is the great number of excellent illustrations which are for the most part photographic reproductions.

INFECTION IMMUNITY AND BIOLOGIC THERAPY, by *John A. Kolmer, M. D., professor of pathology and bacteriology in the graduate school of medicine, University of Pennsylvania; and member of the Research Institute of Cutaneous Medicine, Philadelphia.* Third edition. W. B. Saunders Co., Philadelphia, Pa., 1923.

The second edition of this popular work which came out in 1917 was slightly different in title from the present edition, having been called Infection Immunity and Specific Therapy. The adjective "Biologic" in this third edition replaces "Specific" in the title of the second edition. In spite of the fact that a considerable amount of material has been removed from this edition in order to include it in separate monographs the third edition is increased by 232 pages over the edition of 1917.

The author had in view the same purposes as prompted former editions, which are: (1) To give practitioners and students of medicine a connected and concise account of our present knowledge regarding the manner in which the body may become infected, and the method, in turn, by which the organism serves to protect itself against infection, or strives to overcome the infection if it should occur, and also to present a practical application of this knowledge to the diagnosis, prevention, and treatment of disease; (2) to give to physicians engaged in laboratory work and special workers in this field a book

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to serve as a guide to the various immunologic methods; (3) to outline a laboratory course in experimental infection and immunity for students of medicine and those especially interested in these branches.

The volume is divided into five parts. Part I, general immunologic technique, contains four chapters. Part II contains two chapters devoted to a consideration of infection. Part III, dealing with the principles of immunity and special immunologic technique, contains 21 chapters covering some 535 pages. This is the largest division of the book. Part IV, clinical allergy and biologic therapy, extends over some 466 pages and contains chapters on the following important subjects: Allergy in relation to infection, clinical allergy, treatment of human allergies, the Schick test for immunity to diphtheria, principles of active immunization, vaccines in the prophylaxis and treatment of disease, principles of passive immunization, sera in the prophylaxis and treatment of disease, methods for the administration of serum in the prophylaxis and treatment of disease, prophylactic serum or passive immunization, the principles of nonspecific protein therapy, vaccines, sera, blood, and nonspecific proteins in the treatment of disease, biologic therapy of tuberculosis, and blood transfusion. Part V outlines a laboratory course in experimental infection and immunity. This occupies only 22 pages of the book and the index accounts for 50 pages. There are 202 original illustrations in the volume of which 51 are in colors.

This volume seems to answer fully and satisfactorily every question which may reasonably be asked of it. Whether the question be one pertaining to technique, to theory, or to the practice of immunology, the reviewer finds that the answer is full, lucid, scholarly, and logical. Methods are everywhere well chosen, and the author shows in every selection the abundance of his personal experience with all phases of immunology. This work is a masterly presentation of the subject of which it treats.

The publishers have furnished a well-printed, well-illustrated, and well-bound volume. The paper is good and the volume is not too heavy to be easily handled. It may be recommended as a standard book for the student, the physician, and the laboratory worker.

THE PRINCIPLES AND TECHNIQUE OF ORAL SURGERY, by *Adolph Berger, D. D. S., assistant professor of oral surgery, school of dental and oral surgery, Columbia University; chief of clinic, oral surgery department, Vanderbilt Clinic; instructor of oral surgery, advanced courses, university extension, Columbia University, oral surgeon to Beth Israel Hospital.* Dental Items of Interest Publishing Co., Brooklyn, N. Y., 1923.

With the publication of "The Principles and Technique of Oral Surgery," by Adolph Berger, D. D. S., of New York City, a book becomes available which is valuable to the practitioners of dentistry who desire information of modern procedures along this line. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

author is one of the pioneers of oral surgery as a specialty, having received instruction in conduction anesthesia from Dr. G. Fischer, and happily has been for years affiliated with large clinics in New York City, where a wealth of material has given him opportunities and clinical experience excelled by few.

Dentistry has made such remarkable progress in the past 10 years that one has had to rely largely upon current literature for information relating to modern procedures. Books on oral surgery have been published, but in each an attempt was made to cover a larger field than falls within the province of the average dentist. It is, therefore, a relief to find a book which outlines procedures which are, or should be common to every practice embracing the diagnosis and treatment of dental diseases. A noteworthy feature of the book is that it embodies to a large degree the results of the author's practical experience, and in this connection a very pregnant statement appears in the preface, "Still, in so far as this has been possible, I have attempted to avoid compilation." This statement is exemplified in the text when the author differs from accepted opinions, and in these cases he states his differences clearly with his reasons for differing from the generally accepted viewpoint.

A careful examination of the text reveals a unique feature, which may recall De Quincy. It is a sentence of 171 words found on page 138.

To the student it is a book which will make the study of the practice of dentistry much less laborious, and to the man in practice it furnishes a reference which can be relied upon as based on methods which have been tried and not found wanting.

Three hundred and fifty-five engravings embellish the text, and to one with a knowledge of the difficulty of reproducing radiographs and photographs of actual conditions in the mouth these illustrations are a revelation. A very pleasing method of illustrating is used in that the whole area involved is outlined with a line drawing for orientation, and the part being illustrated is engraved in detail.

The book as a whole is somewhat of a relief from war surgery, comprising as it does cases which are to be met with in civil practice. Case histories illustrating principles are numerous, thus furnishing opportunity for the reader to appreciate all factors of the condition under discussion.

In the chapter on the surgical treatment of pyorrhea one may not agree that the operation set forth is equal to that advocated by Dr. A. D. Black, for as Doctor Berger himself points out, the result of the operation given is that cicatricial tissue is formed at the very place where it is least desirable.

The chapter on necrosis, and the before and after pictures, seem to substantiate the admonition as to conservation of tissue and perios-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

teum, leaving to nature the line to be drawn between living and necrosed tissue.

An interesting point is brought out in connection with the reactions resulting from conduction injections. Immediate reaction is to be expected where they are made into infected areas, whereas that resulting from a septic syringe or solution is usually delayed in appearance for from five to eight days.

Hyper or hypotonic solutions, high concentration or excessive doses may be the cause of post-injection pain, as well as untoward local and systemic complications.

The removal of broken needles is described, and this description is indeed a friend in need. However, in this connection his experience has been that steel needles are responsible for most of these unfortunate occurrences, and the use of a strong iridio-platinum needle is recommended to prevent such occurrences.

A good word is spoken for the use of iodoform gauze as a pack and drain. The author states that in his experience any other gauze impregnated or sterile will become very foul in the mouth after even four or five hours, while iodoform gauze may be left in the mouth two or three days without becoming foul smelling. The iodoform also possesses mild analgesic, antiseptic, and stimulating properties, exerting a salutary influence upon granulation tissue. He recommends the use of a powder such as procain, orthoform, or anesthesin dusted directly upon the exposed surface before suturing or packing, and as routine suturing, with an iodoform gauze wick between sutures at the lowest point of drainage.

Under dentigenous cysts an interesting history is given in which the patient exhibited the following symptoms for three or four years previous to treatment: Headache, lack of appetite, insomnia, and gastrointestinal derangement.

In the treatment of maxillary sinusitis attention is invited to the importance of examining teeth in the vicinity of the infected sinus, though these teeth may not be the primary cause of the condition, but perhaps become involved during the course of the disease. For these he recommends vitality tests in order to eliminate the possibility of their causing a continuance of the disease.

Cysts are considered the result of the degeneration of the so-called granulomas, or pericementomas, and three operations for their removal are given, with the respective merits of each.

The author does not agree with the commonly accepted theory that ranulas are the result of an obstruction of the duct of a gland, and suggests that they are most likely a cystic degeneration of one or more lobes of the affected gland.

The belief that a blood clot can be depended upon to insure bone regeneration is not borne out by his experience.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Of great value is the method given for the removal of broken-down roots, and this method illustrated fully should save many hours of disheartening work for the operator, to say nothing of the lacerated tissues and feelings of the patients.

Under impactions he cites the possibility of severe neuralgic reflexes from impacted teeth, with an entire absence of any inflammation or local symptoms.

In removing bone to permit of the removal of impacted teeth, Doctor Berger favors the use of the surgical bur as enabling more rapid work, with less trauma and much less psychic reaction.

Under treatment for fractures the two important steps given are reduction and immobilization, using where possible the occluding surfaces of opposing teeth as a splint, with intermaxillary wire lacing.

A MANUAL OF LAND AND FRESH WATER VERTEBRATE ANIMALS OF THE UNITED STATES (EXCLUSIVE OF BIRDS), by *Henry S. Pratt, David Scull professor of Biology in Haverford College, Pennsylvania, instructor in comparative anatomy in the Marine Biological Laboratory at Cold Spring Harbor, Long Island.* P. Blakiston's Son & Co., Philadelphia, Pa., 1923.

In this book the author furnishes those interested in zoology with accurate diagnostic descriptions of the land and fresh water vertebrate animals of the United States, together with analytical keys by means of which they can be readily identified. All the species of fishes, amphibians, reptiles, and mammals found between the Canadian and Mexican borders are described and their geographic limits and manner of life indicated.

THE HYGIENE OF MARRIAGE, by *Isabel E. Hutton, M. D.*. William Heineman (Ltd.), London, 1923.

This is a readable little book in which the author presents in a clear manner, those facts concerning the hygiene of marriage of which so many about to be married are ignorant.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE.

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge.

Notes on Preventive Medicine for Medical Officers, United States Navy.

THE PREVENTION AND CONTROL OF CEREBROSPINAL FEVER IN THE BRITISH ARMY AS REVIEWED IN THE OFFICIAL HISTORY OF THE WAR.

The prevention of cerebrospinal fever among troops in England during the war is discussed by Surg. Col. R. J. Reece, senior medical officer, ministry of health, in Chapter IX of Volume 2, Medical Services, Hygiene of the War.

The prevalence of the disease and the epidemiological studies which were made in England during the Great War will be of interest to medical officers in view of our experience with cerebrospinal fever and the conclusions reached regarding its prevention and control in the United States Navy in 1917 and 1918.

Although the author's language has not been changed more than was necessary in order to brief the article, sentences have been combined and in some instances paraphrased. If, as a result of incomplete statement, the author's views in matters of opinion are not accurately expressed it is unintentional on the part of the reviewer.

At the end of 1914 it became evident that cases of cerebrospinal fever were occurring among the troops in the United Kingdom. At a meeting of the army sanitary committee on the 12th of January, 1915, reports of the incidence of the disease from numerous commands were read, and a report on cerebrospinal fever among troops of the Canadian contingent camped on Salisbury Plain was discussed. The committee recommended that Surg. Col. R. J. Reece, then attached to the Honorable Artillery Company, who had had considerable experience under the local Government board in the conduct of inquiry into this disease should be seconded with a view to utilization of his entire services in connection with the various outbreaks then under report, and any others that might occur. A scheme for the administrative control of cerebrospinal fever was at once put into operation. It was evident that the control to be effective must take account of the occurrence of cases among the civil population, and arrangements were made for notification of civilian cases with a report on each case by the capital medical officer of

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

health in whose district it occurred. Medical officers of troops were required to notify by telegram to the war office each case as it occurred. A central laboratory was established at the Royal Army Medical College in London for investigation, research, and instruction purposes, and Dr. Mervyn Gordon, who had done special work in regard to the bacteriology of cerebrospinal fever, was granted the honorary rank of lieutenant colonel in the R.A.M.C. and appointed consulting bacteriologist in charge of the laboratory.

The country was then divided into administrative areas and some 40 special bacteriological laboratories were established in the several commands in England and Wales and others in Scotland and Ireland and in the Channel Isles at Jersey for purposes of diagnosis and study of the microorganisms. So far as was found practicable existing laboratories were utilized and subsidized. Thus, in each of the areas into which the country was divided for administrative purposes there was a laboratory which dealt specially with cerebrospinal fever. The bacteriologist of this laboratory dealt with the cases of cerebrospinal fever that occurred in the area served by the laboratory and with the contacts of such cases. He, or an assistant acting for him, swabbed the patients and the contacts. Records were kept of each case and the circumstances in which the case occurred. A motor laboratory especially designed for this work was also fitted up. This traveling laboratory proved most useful in the early months of the war, as it was possible to dispatch it during emergencies to places where the local staff was inadequate to deal with a large number of contacts or where the bacteriological laboratory was not easy of access. On such duties it was sent to Devenport, Avonmouth, South Hampton, Dover, Scotland, and other places. It was found of special value within London and in its immediate neighborhood.

A memorandum on the procedure to be adopted on the occurrence of a case of cerebrospinal fever in a military camp was drawn up and issued on the 25th of February, 1915. Other memoranda were issued from time to time. In May, 1916, these memoranda were revised and issued as a single document. Further investigation was made in March, 1917, and again in March, 1920. The last edition embodies the experience obtained during the war.

There was a shortage of trained bacteriologists, and before long the demand for them for service overseas resulted in many of the officers originally selected for cerebrospinal fever work being drafted to the army abroad. Therefore, it sometimes happened that the bacteriologist who had been in charge of the laboratory during the busy period had left for overseas service before the report was prepared. In such instances the reports lacked the impressions of the actual

Digitized by Google Original from UNIVERSITY OF MICHIGAN

worker. Difficulty was also experienced because the efficiency of the civil public health service was diminished owing to civil medical officers of health having gone on military service. Then, too, medical officers doing duty with troops were mainly recruited from civil medical practitioners who had not the advantage of the military medical training which the regular medical officers of the army had received. Nevertheless, the rapid way in which many of these officers acquired a knowledge of military hygiene was remarkable.

It was recognized that the general sanitation of the camp was a matter that could not be disregarded, and in cases where sanitary difficulties were experienced the attention of the specialist sanitary officer of the camp was called to them with a view to their improvement. In matters of more urgent importance the facts were reported to headquarters for consideration. So far as possible all camps and barracks were visited at one time or another so that in the event of cerebrospinal fever breaking out among troops at any place, the general arrangements of the locality and the personnel were known, and any necessary action could be taken. An important step was the appointment of the specialist sanitary officers of commands to be supervising officers for all matters relating to cerebrospinal fever in their command. From time to time these officers were summoned to conference at the war office where points of general interest were discussed, and in this way knowledge of the disease was diffused and uniform action secured.

CARRIERS.

At first, all known contacts of clinical cases of the disease were segregated and cultured. Those furnishing a negative result were discharged to duty; those certified positive were retained for treatment. The latter were segregated in a particular hut or tent and were encouraged to exercise in the open air.

The steam spray method of treating carriers was evolved early in 1916. Many antiseptics were tested, and the best results were thought to be obtained with chloramine-T and sulphate of zinc. The apparatus was portable and by means of it a finely atomized spray charged with the disinfectant could be thrown into the atmosphere so that it was not possible to see across a small room. The rate of spraying to effect that result was found to be 1 liter of antiseptic sprayed in the course of 20 minutes in a chamber of 1,000 cubic feet. They were regarded as effective when properly used, and apparently still are so regarded by the author, but the reports on their use showed divergent results. One disadvantage of the spraying hut was that it was a permanent erection, and some men had to march a considerable distance to receive treatment. In the commands it was not an easy matter to decide at what spot such a spraying arrangement

Digitized by Google Original from UNIVERSITY OF MICHIGAN

could best be placed. Therefore, motor vehicles were fitted up to carry all the required apparatus in order that a small marquee might be used as a spraying room, another as a waiting room, and a third as "cooling-off" room during inclement weather.

Two old motor-car engines were acquired and fitted to a carriage capable of carrying a portable steam spray apparatus which could be used inside a marquee, barrack room, or hut, and a nozzle or jet which could be easily cleared of obstructions was devised. The canvas marquee gave even better results than the fixed hut. These experimental plants were tested and found satisfactory so far as atomization and retention of steam in the tent or hut were concerned. The plants were then employed in connection with the arrival of troops from dominions overseas and sent to places where spray treatment was considered necessary.

When the spraying chamber was first introduced the value of a constant change of atmosphere was not realized. In one command an order was issued for a couple of detention cells of a regimental guardroom to be made practically air-tight so that they could be utilized as spray treatment rooms for the men of the unit. It was soon found undesirable for carriers undergoing treatment to be in an atmosphere under conditions which necessitated their breathing the same atmosphere again and again, although this was charged with an antiseptic. The physiological effect of introducing men into a chamber so densely filled with atomized steam charged with an antiseptic which could be tasted had to be reckoned with. These men were also undergoing "antigas" instruction and the effect of poisonous gases was a very real matter with them. The result was that a certain number of men fainted when standing still in the chamber, a not uncommon occurrence with men on parade in trying circumstances. It was, therefore, arranged that the men should be seated on benches facing opposite ways, and each man was allowed 27 square feet of floor space. Under these conditions the men could not breathe on one another and they did not drop in the fainting condition when seated. Experience affords ample evidence that when men were crowded into the spraying chambers the desired effect was unlikely to be obtained. There was also a distinct possibility of infection being transmitted in the spraying chamber. It is only possible to say that the use of steam spraying chambers charged with an antiseptic appeared to have beneficial results of sufficient importance to warrant the application of the method to the treatment of troops exposed to infection of cerebrospinal fever. When dealing with diphtheria carriers the result was disappointing, and the inherent difficulties associated with influenza are such that further experience and knowledge are required before any pronounce-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ment can be made with regard to antiseptic spray treatment of this malady.

Arrangements were made to install the spray treatment on board transports, the steam being sprayed in most instances from the steam pipes of the vessel. Cases of cerebrospinal fever were occurring among troops in camp in the overseas dominions. The first Canadian contingent that arrived in England brought infection with them. Similiarly, Australian and New Zealand troops suffered on the voyage, apparently through carriers. It was part of the scheme that the troops should be swabbed before embarkation, and only those giving negative results should be embarked. This was a comparatively simple matter, so far as New Zealand was concerned, as the troops were numerically few, and the executive staff and medical officers concerned were keenly alive to the desirability of embarking only those men who were free from meningococcal infection. The result was entirely satisfactory. It was otherwise with Canadian and Australian troops, as the number to be reckoned with was much larger and the importance of only embarking troops free from meningococcal infection was subservient to that of placing these troops at the earliest possible moment in the fighting line.

In the early months of 1917 anxiety was caused to those who were watching the course of the disease by the fact that the actual number of military cases notified was larger than in either of the previous two years. Recruits joining the army showed an increasingly high carrier rate, and in consequence it was said that the troops were being infected by those joining the ranks from the civilian population. Doubt was expressed as to the efficacy of the means employed to control the prevalence of the disease among the civil population. Actually, the proportion of attacks to the number of troops serving was lower in 1917 than it was in 1915, although the number of notified cases was larger because there were more men in service. In order to obtain a true estimate of the proportion of carriers among recruits joining a depot from the civil population it would be necessary to examine each man on arrival before he had mixed, even for a single night, with soldiers in the depot. Obviously, this could not often be done. In one instance when an examination of recruits was made at a depot, 20 out of 27 recruits examined were returned as positive. On investigation it was found that the shortest time that any one of these 27 recruits had been in the depot was 14 weeks and 5 days.

The distribution of cerebrospinal fever among the civil population closely approximated to the distribution of the troops, and many instances are recorded in which the disease was introduced by soldiers returned to their homes. The conditions under which the troops live favored the spread of infection from person to person,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and dominated the prevalence of the disease among the civil population. In the first three months of 1917 the carrier rate in the civil population probably rose above the average rate, but no exhaustive attempt was made to ascertain this, and even had such an attempt been made, and the presence of a high carrier rate confirmed, it could not have been subjected to comprehensive measures of administrative control. There is no legal power compulsorily to examine contacts or even the patient, who is entirely in the hands of the general practitioner unless removed to an isolation hospital where he comes under the charge of the medical officer of the hospital.

The difficulty in arranging for the examination of swabs from the nasopharynx of contacts in the civil population is also partly due to the short life of the meningococcus under adverse conditions and to the fact that examination of swabs sent by post is useless. Moreover, a bacteriologist was not available for this work in many places.

It is believed that the bulk of contacts who are shown to be carriers free themselves in a short period—probably in about three weeks. In all probability it is the chronic carrier who spreads the disease, and principally at times when he is suffering with catarrh. Furthermore, the treatment of carriers by means of the steam atomizer was still in its infancy. Its full value has even yet to be determined.

It was suggested that a serious attempt might be made to eradicate carriers from the population during the summer months when the carrier rate is presumably very much lower than in the winter. The number of persons to be examined bacteriologically would be the same at any season of the year inasmuch as it would not be possible to say whether a man was a carrier until he had been examined. However, the work of the bacteriologist would be less in the summer than in the winter because he would be dealing with a greater number of negatives. The work of undertaking a bacteriological examination of swabs from the nasopharynges of the population would be very great even in a moderately large town. To get the result aimed at it would be necessary to segregate the population after swabbing until the result of the swabbing was known, and when known to be negative such negative person should not associate with any unswabbed person, lest he become infected. Even if legal powers existed to enforce this procedure it could not be put into operation because the civilian population would not submit to it.

At times more cases of cerebrospinal fever occurred in the military population than in the civil, notwithstanding the fact that the number of civilians in the United Kingdom was more than 20 times as great as the number of soldiers. While it is probable that infection was carried at times from the civil population to the troops,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

yet when dealing with a disease like cerebrospinal fever, in which spread of infection is largely dependent on close aggregation of persons—a factor peculiarly associated with the conditions under which the soldiers lived, among whom there was special incidence of the disease—it follows that it must frequently have happened that the infection was carried from barracks and camps by individual soldiers to the civil population. The desirability of obtaining effective control over the military carrier was evident, both in the interests of the civil population and of the troops. The endeavor to discover the best method to give practical effect to this control gave rise to anxious thought.

Attempts were made to swab large numbers of men. It is clear that it is practicable to make a bacteriological examination of swabs taken from the nasopharynx of each soldier in a barrack or camp, and if all soldiers found to be carriers were segregated and could be cured of their carrier condition, freedom from the disease would follow, as the source of infection in the camp would be removed. The amount of work entailed in carrying out such universal swabbing is directly proportional to the number of men dealt with. It can readily be seen that for practical purposes it would be impossible to extend this method to the whole army.

Nevertheless, in certain instances where a regiment had a succession of cases all the men were examined and after segregating all those found to be carriers, clinical cases of the disease ceased in the regiment so dealt with. While the bulk of the carriers soon ceased to harbor the meningococcus in their nasopharynges, the examination discovered the existence of a few chronic carriers who retained the carrier condition for long periods, in some cases for months. It is probable that persistence of the infection in the regiments concerned was due to the presence of these chronic carriers. These attempts to examine each man in a regiment clearly showed how impracticable it was to deal in such fashion in a camp of even a few thousand men.

HOUSING OF TROOPS AS A FACTOR IN THE PREVALENCE OF CEREBROSPINAL FEVER.

When considering the possibilities of spread of infection among troops some general idea can be obtained by comparing housing conditions with those of the civil population. The average number of civilians per house in England and Wales is roughly 5 persons, and when infectious disease occurs in a house, the liability of its spread is limited to the number of susceptible persons in the household. The number of soldiers in a barrack room or hut usually far exceeds 5, and if an arbitrary figure, say 30, is taken, it will be seen that the liability of the soldiers to contract the infection is at least

Digitized by Google Original from UNIVERSITY OF MICHIGAN

6 times as great as that of the civilian. But this numerical basis is not the sole factor, inasmuch as 5 civilians, while they might share a room during the day, would be separated at night and sleep in two or three bedrooms. In ordinary circumstances the bedrooms are occupied for an uninterrupted and longer period than the day room. The soldier, however, has only one room, which serves as a day room and bedroom. During the night the air in a room is more or less stationary in part due to the occupiers not moving about and the humidity of the atmosphere increases.

The ordinary person dislikes drafts and the soldier is no exception to this rule. Notwithstanding advice, instruction, and close supervision by regimental officers, the soldier almost invariably has a tendency to block or obstruct the ventilation. To realize how contaminated the atmosphere may become one has only to enter an occupied barrack room, or hut, in the middle of the night or in the early hours of the morning. The hygienist who knows that certain rooms or huts have sufficient space to accommodate the given number of men requiring to be housed may consider that the matter is disposed of unless he realizes the importance from the military point of view of keeping units, companies, and platoons together under the immediate supervision of their own officers and noncommissioned officers. A tendency in the army is to collect the men of a unit together and to concentrate them in certain rooms or huts rather than disperse them and mix them with men of other units. This is a serious defect in spacing men out, and it constituted one of the problems which had to be reckoned with and considered carefully from the point of view of the officers in executive command. Barracks, in regard to their suitability for housing soldiers, varied within very wide hygienic limits. While the modern barracks, erected immediately prior to the war, left little to be desired, the old barracks dating back 50 years or more do not comply fully with modern requirements, notwithstanding structural alterations in recent years. The mobilization for war necessitated the use to their fullest extent of all available barracks. A barrack room which approximates a square, and affords the 600 or the 400 cubic feet of space for each inmate, and 60 to 40 superficial feet per bed, will lack, when the beds are arranged with the head of each bedstead against the wall, the most essential measurement, namely, space between beds. In such circumstances when spaces occupied by fireplaces, doors, etc., are taken into account and the beds are arranged round the available wall space, they are practically touching one another. Also in these square barrack rooms it frequently happens that there are windows only in one wall, and for cross-ventilation the room depends to a large extent on the fireplace and door. In such instances the attempt

Digitized by Google Original from UNIVERSITY OF MICHIGAN

was made to secure the required distance between "heads" by drawing alternate beds several feet from the wall and by placing certain beds in the central floor space at night.

Although many kinds of army huts were built and the designs varied within wide limits, there were two types that came to be regarded as the standard patterns. One type measured 60 by 20 feet and the other 60 by 15 feet. Such huts on the standard of 600 cubic feet and 60 superficial feet to a man accommodated 20 and 15 men, respectively, and on the 400 cubic feet and 40 superficial feet mobilization basis they housed 30 and 22 men, respectively. The available wall space per bed is influenced by the position of the stove, whether this is in the center of the hut or at the side. When in the latter position it occupies space that might otherwise have accommodated a bed. From the point of view of wall space per bed, provided the cubic capacity and superficial area are adhered to, there is advantage in the 60 by 15 feet hut, as this, on the long sides alone, and without taking the short sides into consideration, allows, even when the fireplace is placed on one of the long sides, 7½ linear feet and 5 linear feet per bed on the 600 cubic feet and 400 cubic feet per bed basis, respectively; whereas the 60 by 20 feet hut gives only 6 feet and 4 feet per bed, respectively, and this without allowing for the fireplace. The position of the stove in a hut is of importance from the dual point of view of the available amount of space warmed and the facilities afforded for spread of droplet infection. When placed centrally the men sit round the stove in a circle, but when it is against the wall the warmed space is limited to a semicircle.

Some of the huts erected were of very large size, a single hut being built to accommodate 400 men. When infectious disease breaks out in such a hut, administrative procedure in dealing with the occurrence is seriously handicapped owing to the large number of "room contacts." On one occasion when cerebrospinal fever occurred in one such hutment 352 men were swabbed and 14 carriers detected. It must be borne in mind that under ordinary conditions a bacteriologist can only deal with about 100 men per day, and on each succeeding day this number becomes less, as a certain number of the plates have to be subcultured. Also the capacity of the incubator is necessarily limited, and although the number of plates dealt with varies with the size and number of the incubators, it is manifest that for practical purposes the number of incubators in a laboratory must be restricted. To meet this difficulty the bacteriologists not infrequently deal with two swabs, and, under great pressure, with 4 swabs on 1 plate.

Billets.—Although billets varied considerably, those in private houses could be regarded as satisfactory on the whole; at any rate,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the soldiers and the civilians were housed under like conditions. In many instances, not only the poorer class of dwellings but also in the better class residences, the householders devoted much thought and care to the comfort of the troops. The disadvantage of this class of billet was that when a bedroom occupied by two soldiers contained only one bed, and that a double bed, the two soldiers slept in it. It was of little avail to point out that one of them should sleep on the floor wrapped in army blankets. This type of billet cost more per head than unfurnished houses, public halls, disused factories, etc. In the latter type men of a unit could be grouped together and central cooking and feeding rooms could be instituted. Therefore, not only on the score of expense but also for purposes of supervision, such places when available were used in preference to billeting soldiers on the civil population. While some of this type of billet compared closely with the ordinary barrack accommodation, except that often latrines and ablution arrangements were deficient, there were others in which the reverse was the case and in which ventilation was seriously defective. Also, from the early days of the war, the windows of billets on the east and south coast overlooking the sea, and of those inland during the period of air raids, were screened at night. In many homes used as billets the window panes were colored dark blue; the direct rays of the sun were excluded and the interiors were always dark; this had a depressing effect on the spirits of the men. At night army blankets were in many instances fixed up across the windows, impairing ventilation when it was most needed.

Several limited outbreaks of cerebrospinal fever occurred among men so housed and this circumstance had the immediate result of having these halls and factories put into reasonable sanitary condition or led to their ultimate evacution. Such outbreaks, however, were not limited to these places; a certain number also occurred in private billets. It must be remembered that in the early days of the war many medical officers had not previously done duty with troops, and these officers had yet to learn that their first and most important duty was to keep their men fit. In the selection of billets and when arranging for the number of men who should be housed in a billet, in some instances either the medical officer of the unit was not consulted or he failed to appreciate the principles of hygiene involved. Officers specially engaged in cerebrospinal fever work, by drawing attention to defective or overcrowded billets, did much useful work in connection with the evacuation of insanitary billets and in the amelioration of unhygienic conditions.

As an aid to medical officers a scale was drawn up in diagrammatic form to show at once the approximate number of men who could be housed in rooms of various sizes, while securing per head the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

appropriate amount of floor space and cubic space. This provided a rapid means of deciding how many men may occupy any room or hut.

On the occurrence of an outbreak of infectious disease in barracks it has been the custom in the army to place a certain number of men, or all men of the infected unit, under canvas. The advantage of such procedure is to reduce the number of men who are in close association with one another so that in the event of further cases occurring, the immediate contacts of a case are reduced from the number of men in a barrack room to the number in a tent, i. e., a smaller number of contacts have to be dealt with. As regards cerebrospinal fever, however, there was on occasion a high carrier rate among the occupants of individual tents.

The question of the number of men that should be accommodated in a regulation bell tent was considered by the army sanitary committee. The measurements of a regulation bell tent are:

Diameter	13 feet 6 inches.
Height (length of pole)	9 feet 6 inches.
Height of side	2 feet.
Floor space	143 square feet.
Circumference	42 feet 4 inches.
Cubic space	684 cubic feet.

A man lying down in such a tent with his feet to the pole would have his mouth on the circumference of a circle of 1 foot less radius than that of the tent, and if the occupied floor is spaced as an undecagon and one space left for the doorway of the tent, the remaining 10 spaces would allow of a distance of 3 feet 3 inches between the centers of the heads of 10 men equally spaced out. Further, if the floor of the tent is divided as a heptagon, and one space is left for the doorway, the distance between centers of heads would be 5 feet. The commands were informed that during the period of the present war the proportions of men to be accommodated in circular single-lined tents should be reduced to 8 mounted men or 10 dismounted men per tent, and that in the event of a threatened epidemic of infectious disease, troops should be at once spaced out to such an extent as will admit of not more than 6 men (mounted or dismounted) occupying a tent. Attempts were made when dealing with battalions of young soldiers to limit the number of men to 6 per tent, and although this attempt met with considerable success, still it was not always possible to arrange, owing to a sufficient number of tents not being available.

OBSERVATIONS RELATING TO ADMINISTRATIVE CONTROL AND EPIDEMIOLOGICAL FACTORS.

Effect of spray treatment.—The author concludes that there can be no doubt that the steam spray treatment reduced the carrier

Digitized by Google Original from UNIVERSITY OF MICHIGAN

rate among troops submitted to the process. For instance, an entire battalion, 1,000 men, was passed seven times through the spraying chamber between the 15th and 19th of March, 1918, after which the carrier rate fell to 4 per cent. At another camp the carrier rate was found to be 22 per cent, and between the 9th and 15th of March, 1918, 1,900 men were passed seven times through the chamber of the mobile steam-spraying apparatus, and the carrier rate fell to 12 per cent. Somewhat similar results were obtained at other camps.

It seemed that not only would the steam spray treatment lower the carrier rate, but that if troops were submitted to the treatment further clinical cases of the diseases would not occur, and this notwithstanding that the carrier rate might not be very much reduced.

This absence of clinical cases could not be attributed altogether to the lessening of the number of carriers; it may have resulted in part from a reduction in the number of meningococci in the nasopharynges of those who still remained carriers, and this reduction may have limited the ability of the carriers to disseminate infection, or again the infective power of the meningococcus may have been reduced.

Incubation period of cerebrospinal fever.—It is difficult to ascertain the actual or probable date of exposure to possible infection. It is not possible to decide whether carriers found among the contacts of a clinical case were infected by the case or whether the patient received his infection from a carrier. It is not known how long a person may be a carrier before developing meningeal symptoms; the great bulk of carriers never do. The following cases are of interest in this connection: A soldier was attacked by cerebrospinal fever and admitted to hospital where his mother visited him. Four days after her visit she was taken ill with cerebrospinal fever, and admitted the following day to the local isolation hospital, where she died three days after admission. She lived in a remote rural district where no cases of cerebrospinal fever had been known to occur. If she acquired the infection from her son the incubation period in her case would be four days.

It is more difficult to define the exact date of exposure to infection when dealing with cases in the military population, where the men are closely associated, than it is among the civil population. The following cases are possible instances for estimating the length of the incubation period: Two soldiers, A and B, belonging to different regiments and separately housed, were, by a misunderstanding, removed to hospital together in an ambulance February 11, 1917. "A" was suffering from a distinct attack of cerebrospinal fever; "B" from acute bronchitis, showing no signs of cerebrospinal fever.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

However, the latter, "B," died of a fulminating attack of cerebrospinal fever two days later. Possibly the bronchitis from which he suffered may have rendered him peculiarly liable to infection. Unless he was actually suffering from cerebrospinal fever of which bronchitis was a symptom the circumstances indicate that the incubation period may be as short as two days. Again, "C" found "D" unconscious in a latrine and helped him to bed and looked after him. "D" proved to be an acute case of cerebrospinal fever. Five days later "C" developed symptoms of the disease.

Communicability of cerebrospinal fever.—It has been stated that cerebrospinal fever has a low degree of infectivity. This statement is probably correct if it is limited to the cases that develop clinical symptoms indicative of involvement of the cerebrospinal system, but incorrect if persons who harbor the causative organism are regarded as persons suffering from the infection. Inasmuch as these latter persons seldom or never suffer discomfort and may be and generally are unaware of their condition the infection may become widespread in a community, and its presence only realized when some person suffers an attack which is clinically recognized. The many instances of multiple cases of the clinical disease that have occurred in families show that at times the infection may operate with great virulence under favorable conditions. On the other hand, spread of infection in hospitals has not been a marked feature of the disease. This may be due to the care taken to ventilate hospital wards and to the fact that in hospitals there is, as a rule, ample space between beds. Nevertheless, from time to time nurses engaged in attendance on cases of cerebrospinal fever suffered clinical attacks of the disease. Fifty such instances, 20 of them with fatal results, occurred during the years 1915 to 1918, among nurses in attendance on military cases. Medical officers in attendance on the sick developed the disease in four instances, and 3 of them died. Also bacteriologists engaged in cerebrospinal fever work did not escape, and at least 2 died of the disease. Taking the number of nurses and medical officers who were at one time or another brought into close relations with the clinical cases of the disease, the number attacked can not be considered high.

Certain observers have stated that it is not possible to trace the infection of cerebrospinal fever to a definite carrier. Although it is often impossible to obtain conclusive evidence, nevertheless the investigation has on several occasions resulted in establishing evidence of infection which is indisputable.

Development of cerebrospinal fever in carriers.—Several instances occurred in which men who had been swabbed with negative result subsequently developed clinical symptoms of cerebrospinal fever. In considering how and when infection may have taken place, it

Digitized by Google Original from UNIVERSITY OF MICHIGAN

was not possible to exclude the possibility of infection subsequent to the swabbing; also the meningococcus may have been present in the nasopharynx when the swabbing took place and it may have been missed by the bacteriologist. Such cases gave rise to the suspicion on the part of certain observers that when once the meningococcus became established in the nasopharnyx the carrier was safe from a clinical attack of cerebrospinal fever. This theory is certainly incorrect, though it received support in view of the number of known carriers who never showed clinical symptoms. One report states, "it is a remarkable fact that of all the numerous carriers isolated at the School of Army Sanitation, Aldershot, not one ever developed cerebrospinal fever"; but it is added, "only one of all our carriers who was isolated in another place developed the disease after the lapse of a week." There were a good many cases in which known carriers developed clinical symptoms and in which the meningococcus was recovered from the cerebrospinal fever fluid. Three instances were mentioned. In each of these cases the disease developed within 10 days after the subject had been proved to be a carrier. When attention was specially directed to the matter it was not uncommon to find that the carriers developed minor meningeal symptoms while in isolation. Such symptoms lasted for only brief periods and amounted to little more than a headache accompanied by slight rise of temperature and perhaps vomiting.

How long after he has become a carrier of the meningococcus a person may suffer a clinical attack of the disease can not be stated. Colonel Flack recorded a case in which a soldier who had been isolated as a carrier for six weeks developed the disease. It is quite possible that this time falls short of the maximum periods.

Influence of travel.—A considerable number of cases occurred shortly after traveling, particularly after long railways journeys. Men proceeding on leave developed the disease within a few days of arrival at their homes, or in transfer from one camp to another. The close association of a number of men in overcrowded railway carriages doubtless afforded time and opportunity for a carrier to distribute infection. With this were associated fatigue, exposure to variable temperature, and loss of regular meals, all factors lowering the power of the body to resist infection. There were also many instances in which a man who had left camp in apparently good health was attacked on the journey, and on occasions more were removed from trains in an unconscious condition.

Relapses.—Some patients who had suffered a severe attack of the disease and recovered and who had not been discharged from the army as medically unfit, suffered a relapse or a recrudescence of the disease on return to military duty. The opinion was gradually

Digitized by Google Original from UNIVERSITY OF MICHIGAN

formed that such men were unfitted for the strenuous work of the soldier, and that it was probably the best course to discharge from the army patients who had recovered from a severe attack of cerebrospinal fever.

Use of a general anesthetic for performing the lumbar puncture.—The consensus of opinion was that the best results were obtained under a general anesthetic. When lumbar puncture is performed several days in succession on a patient without an anesthetic, he comes to dread the operation and apart from the fact that it becomes a real terror to him, there is the difficulty in keeping him still or from flinching when the needle is inserted. Further, the attempt to lumbar puncture, without a general anesthetic, a violent patient suffering from cerebral meningitis and to restrain his movements by force, has been known to be followed by the death of the patient. From a clinical point of view it was considered that a larger amount of cerebrospinal fluid could be withdrawn under a general anesthetic than was otherwise the case, and that the resulting sleep was of great advantage to the patient. It was not thought advisable to lay down any hard and fast rule on the matter in the official memorandum but to leave the decision to the medical attendant, while stating that experience had shown the best results are obtained under a general anesthetic.

Protective inoculation.—Protective inoculation was tried without conclusive results. At one camp 3,622 men out of 5,528 were inoculated. In the next six weeks 5 cases of cerebrospinal fever occurred, 4 of them being inoculated men. Regardless of protective value it was found highly undesirable to attempt to protect troops against the disease in this way while they were undergoing intensive military training during which they were inoculated against typhoid fever and vaccinated against smallpox. A third inoculation against a possible infection could not be undertaken without undue interference with military training. Further, it was known that there was a considerable number of carriers among the troops, and there was the possibility that the injection of a dose of meningococcus vaccine to confer a reasonable degree of immunity might temporarily lower the resisting power of the carrier and render him liable to a clinical attack of the disease. It was decided not to attempt any general protective inoculation against cerebrospinal fever.

Sterilization of drinking vessels.—This measure of prevention formed the subject of an army council instruction to the effect that every drinking vessel should immediately after use be well washed in hot water and dipped in boiling water in such a manner that the upper two inches inside and out become immersed.

Shortage of coal as a factor influencing the spread of cerebrospinal fever.—Owing to the fact that some of the available accom-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

modation in barracks or camp could not be warmed, it was found difficult in times of inclement weather to space men out so that there should be a minimum number of men in every barrack room or hut. The effect was that men objected to living in unwarmed rooms or huts and tended to collect in quarters where there was a fire.

"*Carrier*" *centers.*—The undesirability of keeping carriers in camps and the importance of placing them under expert treatment were recognized, and command "carrier" centers were established to which carriers who did not become free of this condition or yield readily to treatment in a short space of time could be sent for treatment and be under the care of the bacteriologist. The centers were either specially selected in segregated places situated in camp, or certain buildings were taken over for the purpose. In the event of one center being overcrowded attempts were made to transfer a certain number of carriers to another center. Difficulty was often experienced in this transference, as the railway companies objected to the inconvenience associated with the disinfection of compartments that had been occupied by carriers in transit.

It was found generally that the carrier condition cleared up more speedily at the centers situated on the eastern side of England than at other centers. Further, the transference of carriers from one center to another seemed to have a good effect. A carrier condition which had lasted for several weeks often cleared up rapidly upon change of residence. A certain number of carriers returned to their regiments after negative cultures were found later to be harboring the meningococcus. In such cases it was not possible to say whether there was a recrudescence of the carrier condition or whether the man had again become infected on his return to camp. It is, of course, possible that certain men are more prone to become carriers than others. On the other hand the bacteriologist may not always find evidence of the presence of the meningococcus.

The length of time that carriers were under treatment at "carrier" centers varied within wide limits. Much time and attention were given to chronic cases. In spite of persistent efforts many of the carriers harbored the meningococcus for months. Some of the bacteriologists came to the conclusion that treatment was of no avail and that the carrier, if he did not free himself of his condition by natural means, could not be assisted to do so by medical treatment, which might even aggravate the condition. In general, the result of treatment was regarded as unsatisfactory.

Transports.—With the development of submarine warfare all portholes of ships were closed and hatches battened down and the ships made as air-tight as possible while in the danger zone. This

Digitized by Google Original from UNIVERSITY OF MICHIGAN

led to stagnation of air for varying periods, in some cases as long as a week, and to consequent fouling of the air breathed. There were no special arrangements to counteract these conditions brought about by the precautions necessary to safeguard the lives of those on board against enemy attack. Military exigencies required the troops to be carried in transports in excess of the regulation number and the conditions existing on board were such as to favor in the highest degree the spread of infection. Certain men fell sick during the voyage, but others only developed disease after they had been landed from transports, and every man so landed might be a possible factor in the spread of disease.

In the matter of prevention, the ideal aimed at was to submit all troops to spray treatment for 6 or 7 days before embarkation. This was done in New Zealand. It was thought that a steam spray disinfecting plant should also be available at each center to which troops were sent from transports, so that troops arriving in transports known to be infected should receive a week's steam spray treatment immediately upon arrival.

During the year 1917, 51 cases of cerebrospinal fever were landed from transports in the United Kingdom—from Australia 38, New Zealand 6, Canada 3, United States 4—and during that year 179 cases occurred among overseas troops in the United Kingdom; among Australian troops 110, troops from New Zealand 26, Canada 34, South Africa 5, West Indies 1, United States 3. In 1918, from the 1st of January to the 18th of September, 29 cases were landed, including 3 in troops from Australia, 2 from New Zealand, 7 from Canada, and 17 from the United States. Among overseas troops in Great Britain 134 cases occurred during this period. These included 20 from Australia, 22 from New Zealand, 69 from Canada, 3 from South Africa, and 20 from the United States.

Outbreaks on board transports in 1918 led to a thorough inquiry by a committee. The shortage of vessels available for transport of troops and the difficulty of effecting structural alterations prevented full adoption of the measures recommended by the committee and the Army Medical Advisory Board, especially in regard to per capita space allowed troops, and forced ventilation. Minor improvements were effected.

STATISTICAL AND EPIDEMIOLOGICAL DATA.

From the first known case in 1914 to the end of the year 1918, 4,238 cases of cerebrospinal fever occurred among troops in the English, Scottish, and Irish commands, and in the Channel Islands.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The following table shows the incidence of the disease by years, as well as numbers of deaths and case fatality rates:

Year.	Cases.	Deaths.	Case fatality rate per 100.
1914 and 1915	1, 245	617	49. 6
1916	967	430	44. 5
1917	1, 337	593	44. 4
1918	689	288	41. 8
Total, 1914–1918	4, 238	1, 928	45. 5

Seasonal prevalence.—The period of maximum seasonal prevalence of the disease was in the early part of the year. The greatest number of cases recorded in any one week in 1915 was in the first week in March. In 1916 and again in 1917 the greatest prevalence was in the fourth week in March. In 1918 the seasonal rise in the early months of the year reached its summit in the second week in February, although the incidence was not as great and the peak of the curve was less marked than in the previous years. In the three years 1915 to 1917 the rise and fall of the curve to its peak was steep, but after the peak the fall was less abrupt than in 1918. In each of the three earlier years there was a preliminary rise in December. Another factor was introduced in 1918; the greatest number of cases in any one week of that year was notified in the second week in July. This corresponded with the epidemic period of influenza.

In commenting upon this increasing and decreasing incidence it is mentioned that persons exposed to the weather conditions in Great Britain during the early months of the year are apt to suffer from respiratory troubles at a time when opportunity for spread of infections acquired through the nasopharynx is at its height. The circumstances under which the troops lived specially favored the dissemination of such infections. The men were undergoing intensive training which could not be postponed during adverse weather conditions; their clothes were frequently wet, and opportunities and facilities for drying them were few. The result was that the men hung up their wet clothes to dry in their huts and barrack rooms, causing undue moisture of the atmosphere. They had no inducement to remain in the open air; on the contrary, their inclination was to get under cover and huddle round stoves for warmth and for the purpose of drying their clothes. Notwithstanding the vigilance of their officers, windows were shut where possible, and means of ventilation blocked up. It is thus easy to understand why the maximum prevalence of the disease occurred in the early months of the year. It is less easy to account for the sudden rise in the number of cases

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

in the middle of July, 1918. However, the weather in that month was cold and bleak for the time of year. Respiratory catarrhs and chills probably favored the spread of influenza as well as cerebrospinal fever, while the depressing effects of the former may have rendered the sufferers more prone to infection in the latter.

Incidence of attack and fatality in relation to age.—It was not possible to determine the incidence of the disease on soldiers at any given age. The census data necessary to calculate rates were not obtainable, but the actual numbers of cases that occurred at different ages were recorded. The youngest patient was 14 and the oldest 60 years of age. The greatest number of attacks and deaths at any age, 793 and 327, respectively, making 18.7 per cent of total cases and 17 per cent of the deaths, occurred in soldiers aged 18. However, the case fatality rate for that age (41.2 per cent) was slightly lower than the case fatality rate for all ages, 45.5 per cent. Although the figures are not available it is probable that there was in the home commands a greater number of lads of 18 years of age than of any other age, and that those aged 19 came next in total numerical strength. Older soldiers were drafted overseas. This might explain why those aged 19 furnished the next highest number of attacks and deaths, 585 and 252, respectively, or 13.8 per cent of the cases and 13.1 per cent of the deaths. On the basis of the figures collected, the percentage of fatal cases increased as the age increased; at the higher ages the case fatality rate approximates to 100 per cent.

CASE FATALITY BY AGE.

Age.	Number of cases.	Number of deaths.	Case fatality rate per 100.	Per cent of total cases.	Per cent of total cerebrospinal deaths.
14	2	1	50.0	.0+	.0+
15	6	4	66.7	.1	.2
16	21	10	47.6	.5	.5
17	70	29	41.4	1.7	1.5
18	793	327	41.2	18.7	17.0
19	585	252	43.1	13.8	13.1
20	378	152	40.2	8.9	7.9
21	296	130	43.9	7.0	6.7
22	245	108	44.1	5.8	5.6
23	246	111	45.1	5.8	5.8
24	194	84	43.3	4.6	4.4
25	164	65	39.6	3.9	3.4
26	146	73	50.0	3.4	3.8
27	126	53	42.1	3.0	2.7
28	101	53	52.5	2.4	2.7
29	85	57	67.1	2.0	3.0
30	103	54	52.4	2.4	2.8
31	78	34	43.6	1.8	1.8
32	68	35	51.5	1.6	1.8
33	62	36	58.0	1.5	1.9
34	73	41	56.2	1.7	2.1
35	78	45	57.7	1.8	2.3

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CASE FATALITY BY AGE—Continued.

Age.	Number of cases.	Number of deaths.	Case fatality rate per 100.	Per cent of total cases.	Per cent of total cerebro-spinal deaths.
36	53	33	62.3	1.3	1.7
37	33	17	51.5	.8	.9
38	46	26	56.5	1.1	1.3
39	34	13	38.2	.8	.7
40	33	14	42.4	.8	.7
41	28	16	57.1	.7	.8
42	25	16	64.0	.6	.8
43	12	6	50.0	.3	.3
44	12	4	33.3	.3	.2
45	14	11	78.6	.3	.6
46	2	2	100.0	.0+	.1
47	5	3	60.0	.1	.2
48	7	3	42.9	.2	.2
49	5	2	40.0	.1	.1
50	4	4	100.0	.1	.2
51	1	1	100.0	.0+	.1
52	1	1	100.0	.0+	.1
53					
54	1			.0+	
55					
56	1	1	100.0	.0+	.1
57					
58					
59					
60	1	1	100.0	.0+	.1
Total	4,238	1,928	45.5	100.0	100.0

Length of military service as a factor.—A large proportion of cases occurred among recruits during the first few weeks of their service, and it appears probable that recruits acquired increasing immunity as time went on. Of those attacked in 1917 and 1918, 36 per cent of the cases occurred among recruits of less than three months' service and 77 per cent among those who had less than one year's service. Data for the earlier years of the war were not abstracted.

Comparison of case fatality rates among soldiers and the civil male population at certain age groups.—It is probable that the majority of males between 18 and 30 were serving in the army and that the remaining civilians were physically unfit for the life of a soldier. Because of this and the impossibility of making estimates of the numbers of civilian males in the various age groups, reliable conclusions can not be drawn with regard to comparative numbers of cases in the several age groups. However, it appears that of the total number of civilian cases the greatest incidence was at the age periods in which the greater number of military cases occurred. It would seem that case fatality rates were strikingly higher among civilians at each age group. If it be granted that the military population could be classed as "fit" and the civilian population as "unfit," this might in some

Digitized by Google Original from UNIVERSITY OF MICHIGAN

measure account for higher case fatality rates in the latter, but even this would hardly account for the difference between the total military case fatality rate of 45.5 per cent and the total civilian rate of 65.2 per cent.

With regard to military cases, in the first year of the war 49.6 per cent of those attacked died. In the last year of the war 41.8 per cent died. In considering the fatality rate of the military and civil population it is pointed out that after the first few months of the war military medical officers were constantly on the lookout for cases of cerebrospinal fever, and although in a certain proportion of the cases the true nature of the illness was not at first recognized, with the result that these cases did not come under prompt treatment, yet a very large number of cases were provisionally diagnosed as cases of cerebrospinal fever and sent as such into hospital, where some other ailment was found to be the cause of disability. It is, of course, not possible to state with any degree of accuracy the proportion which these cases bore to the total number of true cases, but the experience of the hospital at Salisbury seemed to indicate that army medical officers promptly sent to hospital any suspected cases of cerebrospinal fever, with the result that comparatively few true cases were overlooked, both severe and mild cases coming under treatment. On the other hand, the civil population was depleted of medical practitioners and such as remained were overworked, so it is probable that many mild cases were not recognized, although severe cases would naturally force themselves upon the notice of the practitioner. Comparatively few cases were admitted to isolation hospitals; some were taken to general hospitals, but the bulk of the cases were treated at home where nursing arrangements would fall short of the standard attained in hospitals. Moreover, it was difficult to procure antimeningococcus serum for the treatment of the civilian sick and it was almost unobtainable in rural districts. Furthermore, many practitioners hesitated to perform lumbar puncture, and bacteriological confirmation of the diagnosis was frequently lacking.

The total number of troops in the four years ran into millions, so that the total number of cases of cerebrospinal fever, 4,238, is regarded as comparatively small.

CONCLUSIONS.

At the commencement little knowledge of the disease was possessed; it was considered that safety should be aimed at even if the steps taken were likely to prove in excess of those actually required rather than run any risks which might prejudice adversely the health of the troops. However, exigencies of the military situation had

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ever to be considered. From the first the administrative procedure was based on the supposition that in the main the disease spreads from person to person, and that healthy persons may harbor the infection and be the means of spreading the disease to others. Experience fully justified this provisional assumption. The story of the steps taken to deal with the disease is one of continual progress in efficiency, resulting from close attention to detail and study of the subject by many workers in the field and in the laboratory.

The 4,238 cases of cerebrospinal fever among the troops, if spread over four years, represent an average of approximately 1,060 for each year. This would represent an attack rate of 0.67 per 1,000 per year, a rate that is not in any way excessive in view of the experience of past outbreaks among troops. The number of clinical cases of cerebrospinal fever was so small that the loss of military efficiency due to the disease itself was almost negligible. However, against the disease it is necessary to charge the time lost from military training by segregation of contacts and carriers. It is, of course, not possible to estimate what the attack rate would have been had no administrative steps been taken to control the disease, but it may be said with safety that it would have been much higher than it was. It is also to be taken into consideration that the general effect of improving the hygienic surroundings of the troops entailed in the special precautions taken against cerebrospinal fever operated favorably on the health of the troops as a whole.

Arrangements for mobilization in the beginning were based on an assumption that recruits, as well as troops recalled from the reserve, could be housed temporarily in existing barracks and under canvas with 400 cubic feet of space per capita without much inconvenience, this being a reduction from the pre-war minimum standard of 600 cubic feet. It was thought that matters would right themselves when the expeditionary force sailed. However, the magnitude of the task before the country upset all calculations, and the mobilization scale of 400 cubic feet per man became the service standard. Even this was reduced when large numbers of troops were drafted into a camp. The gathering of young men together in large numbers under conditions of adverse weather, insufficient accommodation, imperfect clothing arrangements, and defective cooking was followed by the first year's seasonal rise of cerebrospinal fever. In the second year, although recruits were still joining the army, the troops were more seasoned, better housed, clothed, and fed, and included a certain number who had returned from overseas. The seasonal curve of cerebrospinal fever was much lower than was the case in the first year. With the third year came the effect of the military service act; again, recruits joined the army in large numbers and the adverse circumstances of the first year were repeated but not to the same ex-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tent, because the camps had become organized and old soldiers were available to teach the newcomers. The fourth year was comparatively free from sudden incursions from large drafts of recruits into the army, and in general the working arrangements of the camps were proceeding smoothly and efficiently. The number of cases of cerebrospinal fever was the lowest recorded in the four years.

At the outbreak of the war there were many medical officers who had spent years in the study of epidemiology and in close association with troops, and who were well acquainted with the report of the commission appointed in May, 1857, to inquire into the regulations affecting the sanitary condition of the army, the organization of military hospitals, and the treatment of the sick and wounded. It was the task of that commission to allot the existing accommodation in all barracks and hospitals so far as practicable in such manner that not less than 600 cubic feet would be provided for every man in barracks with at least 3 feet between every two beds. The standard for hospitals was not less than 1,200 cubic feet of space for each bed, and at least 4 feet between the sides of the beds; and 12 feet from foot to foot when practicable. It is thought that had it been possible to mobilize and subsequently during the period of the war to conform to these standards, little else would have been required to deal with cerebrospinal fever among the troops, and there would have been but few cases of the disease. These standards drawn up 57 years before the war were based on knowledge acquired by experience. Subsequent advances in science have furnished explanation of phenomena then observed, and demonstrated the soundness of the recommendation based on the above standards. Experience gained during the Great War only serves to emphasize and to establish the importance of these standards for future guidance. It remains to be considered whether the results attained by certain other measures are commensurate with the expenditure of time, money, and effort.

COMMENTS RELATING TO HEALTH CONDITIONS, FROM THE ANNUAL REPORT OF THE COMMANDER OF THE UNITED STATES NAVAL DETACHMENT IN TURKISH WATERS.

The detachment has been compelled, by reason of the peculiar nature of its activities, to face unusual sanitary conditions. The itinerary of our ships has of necessity included ports in the Black Sea, Asia Minor, Egypt, Greece, and the Adriatic Sea, in addition to basing upon Constantinople. The disturbed political condition of these regions during recent years has been highly detrimental to national quarantines and internal sanitary regulations, with the result that our medical personnel has had continually to cope with

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the problem of protecting our crews from the dangerous diseases with which they often come in contact.

The sanitary administration of Constantinople and vicinity was assumed by the Allies in 1919, and continued in their hands until November 6, 1922, being conducted by the interallied urban sanitary commission and La Commission Sanitaire Interalliés et des Frontières. The Turkish authorities have been in charge since then. As the result of three and a half years of Allied control, there has been a steady improvement in conditions and a decline in epidemic disease. The Turkish administration inherited an efficient organization. Whatever doubt there may be as to continued effectiveness can be settled only by longer observation. No adverse criticism is justified as yet.

Typhoid fever reached the proportions of a mild epidemic in Constantinople during the first four months of the fiscal year, as was to be expected, considering the poor water supply and the inefficient system of sewage disposal. During the winter, smallpox was quite prevalent, due largely to the presence of the many refugees from Anatolia. In fact, such epidemics as have occurred in recent years have been associated with the refugee influx. No cholera has been present, and other diseases have not been of epidemic proportions. The work of the Allied commissions in preventing widespread epidemics has been truly remarkable and has been of especial value to the detachment, inasmuch as a considerable number of men and officers must be ashore by reason of the nature of their duties.

The sanitary conditions of other ports visited by our ships has, however, not been by any means as good as that of Constantinople. Cholera, plague, smallpox, and typhus fever were quite widespread, especially in the Black Sea ports. A particularly dangerous contact occurred when our ships were engaged in refugee work at Smyrna during the fall of 1922. But for the vigilance and care of our medical personnel, many casualties from disease might have resulted. We are truly fortunate in having had but two cases of smallpox and one of typhus fever. No other diseases were of sufficient prevalence to deserve comment, except possibly those of a venereal nature. The high incidence of these diseases has been repeatedly noted by medical officers in these waters. Despite our efforts along educational lines and prophylactic applications, we have not been able to lower the average admission rate to a reasonable figure.

In view of the insanitary environment within which we have had to work, the sanitary condition of this command is considered to have been satisfactory.

It is with considerable pride that I call attention to an American institution in Constantinople, that has proved a source of much com-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

fort to the sick from the detachment. The American Hospital is operated essentially by American doctors and nurses. It trains native nurses in our methods, and its educational influence may, in time, be of moment. Many of our sick can not be satisfactorily treated on board ship, especially those who require special diets or who are a menace to their shipmates. Such cases most properly are sent to the hospital, and there they are in special wards under the care of a naval medical officer. We are, however, utilizing the U. S. S. *Denebola* more and more for the care of suitable cases, and most of our operations are now done there.

Many changes have been made as regards the ships of this command, and the detachment files are not complete as regards their medical department returns. Under the circumstances, the percentage of sick can not be accurately computed, nor can one ascertain the exact number of deaths, number sent to hospitals, and number invalided home. The necessary data for this information are only in the files of the force commander and those of the Bureau of Medicine and Surgery. The following is, however, considered approximately correct:

Number of deaths	8
Number admitted to American Hospital	489
Number admitted to other hospitals in this region	10
Number sent home by medical survey	47

USE OF CONVALESCENT SERUM IN NEW YORK TO PREVENT MEASLES IN CHILDERN AFTER EXPOSURE.

The preventive value of serum taken from patients convalescing from measles was commented upon in the November, 1923, number of this Bulletin, which included a review of recent literature on the subject by T. W. Kemmerer of the United States Public Health Service.

During the past year convalescent serum has been employed with favorable results by the health department of New York City to prevent measles in young children. Because of the somewhat limited supply of the serum its use has been restricted for the benefit of children under 3 years of age.

The prophylactic value of the serum and the technique employed are discussed in the weekly bulletin of the New York City Department of Health, January 19, 1924, as follows:

A NEW PROCEDURE IN PREVENTING DISEASE.

It is not generally appreciated that measles is a serious disease, and that it causes a large number of deaths each year, especially among children under 3 years of age. While 1923 was a light

Digitized by Google Original from UNIVERSITY OF MICHIGAN

measles year, with only 14,000 cases and 245 deaths, its seriousness was reflected in the record of 1922, when there were 40,669 cases and 977 deaths. There were more deaths from this cause in 1922 than from diphtheria; in fact, while there were 977 deaths from measles in that year, the deaths from scarlet fever, typhoid fever, whooping cough, infantile paralysis, and cerebrospinal meningitis, all told, were 773.

Numerous trials, both in Europe and America, have demonstrated that the injection of serum of persons convalescent from measles confers a temporary immunity upon those who have been recently exposed to that disease. During the last 12 months, this method of preventing measles has been utilized as a routine measure in the contagious disease hospitals of the department of health. The results have been so favorable that it has been determined to make the serum available for general use in young children who have been exposed to the disease. It has been proven that the serum is almost always effective as a preventive if given within four days after exposure. Even if five or six days have elapsed, the serum may prevent the development of infection or at least greatly moderate its severity. The dose is one vial of 4 c. c. to children under 2 years and two vials to those who are older.

As the supply of serum is somewhat limited, it has been decided to distribute it for exclusive use among children under 3 years of age, if less than seven days have elapsed since they were exposed to a case of measles. This limitation is made because of the fact that the great danger from measles is the complicating pneumonia which occurs, usually in children under 3 years of age. Under exceptional conditions, as when the development of measles would imperil other children, serum may be obtained for older children.

As measles is very contagious during the catarrhal stage which precedes the rash by three or four days, the other children in a family in which a case develops have usually suffered exposure to the disease for three or four days by the time that the danger is realized. It is, therefore, very important that physicians should obtain the serum from the department immediately upon their discovery of exposure. The blood that is used to produce the serum is obtained from healthy convalescent donors, eight days or more after they have developed a measles rash. The serum is tested for purity and freedom from infection before it is offered for use as an immunizing substance.

A supply of the serum from convalescent cases will be kept in each borough headquarters. Physicians can obtain this serum by going to the office or by sending to the office for it. As it is very important that the department should obtain information not only as to the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

name and address, but also as to the age of the child to whom it is to be administered and the period which has elapsed since the exposure, these facts must be furnished by the physician at the time of obtaining the serum at the borough headquarters. A postal card is attached to the serum container which physicians must fill out and mail to the bureau of laboratories, foot of East Sixteenth Street, Manhattan. A medical inspector or nurse will visit the family about two weeks after the date of exposure, to determine the result of the use of the serum.

The immunizing serum is composed of citrated plasma and is placed in vials holding about 4 c. c.; this is the immunizing dose for a child under 2 years of age. It is to be remembered that the dose for a child over 2 years of age is two vials. For purposes of preservation, the serum contains a small amount of an antiseptic.

A good syringe holding from 4 to 8 c. c., and a fairly large needle, such as is used in giving antitoxin, are necessary. The serum should be injected deeply into the tissues, and, preferably, intramuscularly. The back of the arms and the buttocks are suitable situations for the injection. Before injecting the plasma, the skin at the point selected should be cleaned and wiped with alcohol or painted with iodine. As a rule, no redness, inflammatory reaction, or fever develops. The period of protection following such an injection is not yet fully determined. It is probably between six weeks and three months.

TOXIC EFFECT OF HYDROGEN SULPHIDE.

Attention is invited to the review of hydrogen sulphide literature by Passed Asst. Surg. C. W. Mitchell, United States Public Health Service, and S. J. Davenport, translator, Bureau of Mines, which appeared in Public Health Reports, January 4, 1924.

The conclusion is that hydrogen sulphide is one of the most toxic of gases, comparable to hydrogen cyanide in the rapidity of its action and the concentration from which death will result. In general, its action depends upon its concentration. In concentration of 0.005 it will cause poisoning. Hydrogen sulphide in such low percentage is often found in certain industries. The exact mechanism of poisoning is still unknown.

In this connection a case of poisoning that occurred on board the U. S. S. *Wyoming* a couple of years ago is interesting.

In the forward part of the ship, below the space occupied by the wardroom, there is a sump tank into which drains from the torpedo room lead. Soap and other alkaline cleansing agents along with water and oils and grease used in the care and preservation of the torpedoes were washed into this tank which had to be flushed out and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

cleaned periodically. Whenever the manhole plate which was situated at the bottom of a trunk was removed a strong odor of hydrogen sulphide permeated through the forward sections of the ship up to the upper deck. The tank was not edequately vented, but apart from that it appeared that the gas was evolved from action by the alkaline cleansing agents upon the oils used in the torpedo room.

Upon one occasion when the tank was opened for cleansing, the man who removed the manhole plate was promptly overcome and was carried to the sick bay unconscious. For an hour or so it looked as though he might die. He was partially conscious but his skin was cold and gray with a peculiar yellowish tinge on the face. The pulse was rapid, small, and soft and his breathing shallow. He was surrounded with hot water bags and blankets and stimulated with coffee, strychnine, and adrenalin chloride. The following day he was able to be up and about but was still weak. Three other men who were in the trunk were affected but not sufficiently to render them unfit for work. They vomited and complained of muscular weakness and headache.

For several hours after the manhole plate was removed the odor of hydrogen sulphide was strong in the wardroom and wardroom country. The white paint work in passageways between magazines in the vicinity of the trunk through which the gas escaped turned dark yellow, and bright metal surfaces were affected as might be expected.

ERADICATION OF ANTS FROM SHIPS OF THE UNITED FRUIT CO.

The annual report of the medical department of the United Fruit Co. touches upon the subject of infestation by ants. The medical department succeeded in ridding their steamships of ants by using the formula recommended by E. R. Barber in his article, "The Argentine Ant as a Household Pest," published by the United States Department of Agriculture as Farmers' Bulletin No. 1101. The following paragraphs are quoted from the report:

"*Ants.*—In tropical countries a great many species of ants are to be found and some of them are very troublesome. Certain varieties prove very destructive to vegetation, and it is not unusual to find that a favorite garden plant or shrub has been completely deprived of its foliage overnight.

"Others, like the termites, prove very destructive to furniture and buildings constructed of wood, which they honeycomb and destroy.

"Again some varieties invade the dwellings in search of food and prove a veritable nuisance in the ice boxes and in all accessible food supplies. At times they will enter the beds and bite the occupants,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

causing a great deal of irritation and annoyance. Though not known as being able to transmit disease, their presence calls for methods of extermination.

"During the past year ants invaded some of our steamships in considerable numbers and could not be destroyed by fumigation with cyanide or sulphur gases. Their nests were concealed in hidden recesses of the ships, which could not be penetrated by these agents. Large numbers of the workers or food foragers could be destroyed, but unless the queen ants were reached in the nests the workers were rapidly replenished. We succeeded in ridding the steamships of ants by using the formula recommended by E. R. Barber, published in the Farmers' Bulletin, United States Department of Agriculture, March, 1920, which is as follows:

Granulated sugar	pounds	3
Water	pints	9
Tartaric acid (crystallized)	grams	6
Benzoate of soda (boil slowly for 30 minutes, allow to cool)	do	8.4
Dissolve sodium arsenite (C. P.)	do	15
In hot water (cool, add poison solution to sirup and stir well, add to poisoned sirup)	pint	½
Honey	pounds	1½

Mix thoroughly.

"It was found that the sugar in the preparation recrystallized, and glucose was substituted. This preparation has proved very effective on our ships and probably could be utilized advantageously in tropical dwellings.

"The preparation is placed in small tin boxes, one side of which is indented to render it accessible to the ants. A poison label is placed on the box. The solution of arsenic is sufficiently weak not to destroy the ant until it reaches the nest. A returning foraging ant feeds 12 or 15 others, including the young ants and queens, and in a few days the colony is destroyed; or if not completely destroyed the remnant migrates. If the arsenical solution is too strong the worker is killed before it reaches the nest and its effectivness is lost.

"In the Tropics a nest on a plantation is readily destroyed by making a hole in it and pouring in one to four ounces of carbon disulphide, after which the opening is closed. The fumes rapidly penetrate the chambers of the nest and destroy the colony. In the case of wood ants measures must be taken to prevent their access to the building. We have referred to these precautions in a previous report.

"A preparation consisting of 3 parts by bulk of sodium fluoride, 1 part by bulk of pyrethrum powder, 1 part by bulk of corn starch, has been found very efficacious for the destruction of insects appearing aboard out steamers."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

PHYSICAL EXAMINATION OF FOOD HANDLERS IN NEW YORK CITY.

Beginning November 1 the plan outlined in the weekly bulletin of the department of health, city of New York, for the week of October 20, 1923, was put into effect.

This plan recognized the ineffectiveness of examinations unless carefully and thoroughly performed. Examinations conducted in a hasty, careless, or perfunctory manner are regarded as worse than useless because they beget a sense of false security in the minds of the public. The public demands protection against the spreading of communicable disease.

Under the present scheme the worker pays a fee for his annual physical examination and is justified in expecting that it will be properly performed. Any physician may qualify as an examiner by securing food-handlers' cards from the assistant sanitary superintendent of the borough in which he resides.

A card properly filled out and mailed by the physician must be filed with the Department of Health before a food-handlers' certificate can be issued to the applicant. Applicants, if they desire, may have the required physical examination made at one of the public health occupational clinics.

The sanitary code of the city provides that no person who is affected with any infectious disease in a communicable form shall work or be permitted to work in any place where food or drink is prepared, offered for sale or sold, and that no person who refuses to submit to such examination shall work or be permitted to work in any such place. Where any person is found without a medical certificate issued by the department, prosecution will be instituted against the operator of the establishment. It is estimated that there are very nearly one million persons engaged in handling food for sale in the city. Inspectors of the department of health will visit hotels, restaurants, food shops, food factories, and all places where food is dispensed to the public.

VENEREAL DISEASES AND PROPHYLAXIS IN THE UNITED STATES ASIATIC FLEET.

With changes in Asiatic Fleet Regulations No. 1, published November 13, 1923, the regulations read as follows:

SECTION IV.—VENEREAL DISEASES AND PROPHYLAXIS.

1341. The admission rate for venereal diseases is very high on the Asiatic station. It has been demonstrated that failure of prophylaxis to prevent infection is due to the interval between intercourse and prophylaxis, and that after three hours preventive measures are useless. It is for this reason that the individual prophylactic tube, permitting immediate use, has been adopted.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

1342. Double prophylaxis will be in effect. Tubes will be supplied for use ashore and prophylaxis given to men returning from liberty that have been exposed. Care shall be used to see that all exposures receive prophylaxis. Men returning during the night should report "yes" or "no" and receive prophylaxis immediately. If necessary a hospital corpsman should be on watch for the purpose. This duty will not be delegated to anyone but a hospital corpsman. Monthly inspections for the discovery of venereal disease will be made, and in cases of proven falsehood disciplinary action shall be taken. Reports shall be forwarded to the commander in chief monthly, in addition to the reports required by the Bureau of Medicine and Surgery.

TYPHOID-FEVER REPORT.

The following case of typhoid fever has recently been reported to the bureau:

Water tender, second class, United States Navy. Admitted to the United States naval hospital, Canacao, P. I., December 1, 1923, from the U. S. S. *Hulbert*. The diagnosis was established as typhoid fever by blood culture. The patient died on the seventeenth day of the disease from perforation of the intestine.

Infection was acquired in Manila, where typhoid fever was prevalent. The victim's health record showed that vaccine had been administered October 24, November 1, and November 7, 1919.

This is the first case of typhoid or paratyphoid infection reported since the cases listed in the Bulletin for December, 1923.

DYSENTERY AND THE TENDENCY TO REPORT ILL-DEFINED CASES UNDER A DYSENTERY TITLE.

From time to time numbers of Form F cards are received with the diagnosis recorded as "Dysentery, otherwise unclassified." Usually a number of cards, in some instances many, are received from the same ship or station, covering admissions at or about the same time. It thus appears either that the cases were related to one another or were dependent upon a common epidemiological factor. But it is not clear that they were properly diagnosed as dysentery because most of the cards show only one or two sick days. Some of the cards have indicated no sick days. It is not probable that the clinical manifestations in such cases were due to the presence of living microorganisms capable of producing a disease that may properly be recorded as dysentery.

Cases of diarrhea, cause unknown, should be reported as acute enteritis (322). The cards referred to above have come usually from ships or stations experiencing hot-weather conditions. It is to be remembered under such circumstances that diarrhea resulting from the ingestion of food contaminated with putrefactive organisms is to be ruled out before a dysentery title is selected for recording the case. Meats and other foods which may serve as culture

Digitized by Google Original from UNIVERSITY OF MICHIGAN

media will permit the rapid growth of bacilli of the meat poisoning group—*B. enteriditis*, *B. suipestifer*, etc., as well as *B. proteus* and organisms which cause spoilage when exposed for a few hours in hot weather. Contamination may occur from handling by men with diarrhea who have not thoroughly washed their hands after defecation, or by flies or cockroaches.

In such instances it is probable that the microorganisms will be killed by the cooking process and that symptoms caused by toxic products more or less resistant to heat will be of brief duration—24 hours or less in most cases.

When it seems probable that food was responsible for the diarrhea the case should be returned under the diagnostic title, acute enteritis or, if the circumstances indicate the likelihood of contamination by an organism of the meat poisoning group either from a human or animal carrier, "Poisoning, food (bacterial toxin)" (3602).

REMARKS RELATING TO THE USE OF NOMENCLATURE TITLES.

Enuresis.—The title, "Incontinence of urine," is being used for cases of bed wetting where title 711, "Enuresis," should be used. The former, title 723, is printed in italics and should not be used even in cases of incontinence when the disease or injury responsible for the condition can be recognized.

Enlarged tonsils.—Title 540, "Tonsillitis, chronic," should be used in cases of hypertrophy of the tonsils.

Drug addiction.—Title 2161, "Drug addiction, state drug," should be used; not title 2605, "Poisoning, state substance."

Loss of teeth.—To cover missing teeth or loss of teeth, title 2100, "Absence, acquired (teeth)," should be used; not title 1628, "Loss of substance of (bone or cartilage)."

It is requested that all concerned in the handling of health records and Form F cards be directed to make note of the above remarks.

HEALTH OF THE NAVY.

Morbidity rates based on returns from ships and stations for the month of February are not remarkable. Common diseases of the respiratory type which, as a rule, largely account for increased numbers of admissions to the sick list during the winter season have been less prevalent than usual this year. The combined admission rate for acute tonsillitis, bronchitis, and common colds for February was 137.4 per 1,000 per annum. The median February rate for the five preceding years is 156.8. The rate of all causes was 611 as compared with 767 per 1,000 per annum, the five-year median rate.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Measles cases were reported in decreasing numbers. Only 8 cases were reported from all fleets, and but 17 occurred at shore stations in the United States. Eleven of these were reported by the naval training station, Hampton Roads, Va. The occurrence of the other communicable diseases has not been particularly noteworthy. There were four cases of diphtheria and 18 of scarlet fever; all scattered. Mumps increased in prevalence during the month, especially at the naval training station, Hampton Roads, Va. There were 97 cases among the personnel afloat.

Admissions for influenza made a rate of 26.6 per 1,000 per annum. The February median rate is 137.3. So far no excessive mortality from respiratory diseases is reflected by the weekly health index compiled by the United States Bureau of the Census from telegraphic reports of death from 77 representative cities in the United States.

The following table contains the rates per 1,000 per annum for the principal communicable diseases, February, 1924. For comparison, corresponding median rates are given for the same month, years 1919 to 1923, inclusive:

	February, 1919–1923.	February, 1924.
Cerebrospinal fever	0.08	0
Diphtheria	2.66	0.41
German measles	.65	2.23
Influenza	137.33	26.58
Malaria	13.50	8.12
Measles	13.57	9.43
Mumps	28.49	19.07
Pneumonia	9.57	4.05
Scarlet fever	3.91	1.83
Smallpox	.11	0
Tuberculosis	3.41	2.74
Typhoid fever	.16	.20

VITAL STATISTICS.

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this bulletin are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$ or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

E. R. Stitt.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of February, 1924.*

	Forces afloat.	Forces ashore.	Entire Navy.	Marine Corps.
Average strength	78,617	39,609	118,280	21,238
All causes:				
Number of admissions	3,405	2,616	6,021	938
Annual rate per 1,000	519.37	792.54	610.83	574.16
Disease only:				
Number of admissions	3,055	2,382	5,437	870
Annual rate per 1,000	465.98	721.65	551.58	532.53
Communicable diseases, exclusive of venereal disease:				
Number of admissions	1,136	1,028	2,164	328
Annual rate per 1,000	173.28	311.44	219.54	200.77
Venereal disease:				
Number of admissions	837	315	1,152	194
Annual rate per 1,000	127.67	95.43	116.87	117.53
Injuries and poisons:				
Number of admissions	350	234	584	68
Annual rate per 1,000	53.39	70.89	59.26	41.63

TABLE No. 2.—*Number of admissions reported by Form F cards for certain diseases for the month of February, 1924.*

	Forces afloat, Navy and marines (strength, 78,617).		Forces ashore, Navy and marines (strength, 39,609).		Total (strength, 118,280).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Disease	3,055	465.98	2,382	721.65	5,437	551.58
Injuries and poisons	350	53.39	234	70.89	584	59.25
Total admissions	3,405	519.37	2,616	792.54	6,021	610.83
Class II:						
Varicocele	8	1.22	6	1.82	14	1.42
Class III:						
Appendicitis, acute	49	7.47	40	12.12	89	9.03
Autointoxication, intestinal	8	1.22	8	2.42	16	1.62
Cholangitis, acute	28	4.27	12	3.64	40	4.06
Cholecystitis, acute	7	1.07	0	0	7	.71
Colitis, acute	1	.15	0	0	1	.10
Constipation	22	3.36	17	5.15	39	3.96
Enteritis, acute	27	4.12	17	5.15	44	4.46
Gastritis, acute catarrhal	9	1.37	14	4.24	23	2.33
Gastroenteritis	21	3.20	18	5.45	39	3.96
Hemorrhoids	19	2.90	11	3.33	30	3.04
Ulcer, duodenum	1	.15	1	.30	2	.20
Ulcer, stomach	2	.31	1	.30	3	.30
Total	195	29.74	139	42.11	334	33.88
Class V:						
Laryngitis, acute	12	1.83	15	4.54	27	2.74
Pharyngitis, acute	18	2.75	43	13.03	61	6.19
Rhinitis, acute	10	1.53	8	2.42	18	1.83
Total	40	6.10	66	19.99	106	10.75
Class VIII (A:)						
Chickenpox	11	1.68	2	.61	13	1.32
Diphtheria	1	.15	3	.91	4	.41
German measles	16	2.44	6	1.82	22	2.23
Influenza	112	17.08	150	45.44	262	26.58
Measles	28	4.27	65	29.69	93	9.43
Mumps	138	21.05	50	15.15	188	19.07
Pneumonia, broncho	11	1.68	6	1.82	17	1.72
Pneumonia, lobar	11	1.68	12	3.64	23	2.33
Scarlet fever	3	.46	15	4.54	18	1.83
Total	331	50.49	309	93.61	640	64.93

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 2.—*Number of admissions reported by Form F cards, etc.*—Contd.

	Forces afloat, Navy and marines (strength, 78,617).		Forces ashore, Navy and marines (strength, 39,609).		Total (strength, 118,280).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Class VIII (B):						
Angina, Vincent's	17	2.59	33	10.00	50	5.07
Bronchitis, acute	252	38.44	148	44.84	400	40.58
Catarrhal fever	42	6.41	64	19.39	106	10.75
Tonsillitis, acute	442	67.42	356	107.85	798	80.96
Total	753	114.86	601	182.08	1,354	137.36
Class IX:						
Dysentery, bacillary	6	.92	1	.30	7	.71
Dysentery, entameblc	3	.46	1	.30	4	.41
Typhoid fever	2	.31	0	0	2	.20
Total	11	1.68	2	.60	13	1.32
Class X:						
Dengue	23	3.51	27	8.18	50	5.07
Malaria	10	1.53	70	21.21	80	8.12
Total	33	5.03	97	29.39	130	13.19
Class XI:						
Tuberculosis (all forms)	8	1.22	19	5.76	27	2.74
Class XII:						
Chancroid	160	24.40	80	24.24	240	24.35
Gonococcus infection	595	90.76	190	57.56	785	79.64
Syphilis	82	12.51	45	13.63	127	12.88
Total	837	127.67	315	95.43	1,152	116.87
Class VIII:						
Pleurisy, acute fibrinous	4	.61	7	2.12	11	1.12
Class XX:						
Hernia	29	4.42	24	7.27	53	5.38

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for January, 1924, and from various shore stations for the four-week period February 3, 1924, to March 1, 1924.*

	Annual rate per 1,000 January, 1924.			Average rate since July 1, 1923.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All ships	0	168.61	972.97	0	152.31	972.97
Battleship divisions:						
Battle Fleet	71.53	156.49		67.73	112.12	137.80
Scouting Fleet	143.26	217.01	258.66	110.90	141.27	180.22
Asiatic Fleet [1]	0	355.45	966.82	191.23	533.33	919.23
Destroyer squadrons:						
Battle Fleet	0	63.11	448.60	15.25	68.49	268.37
Scouting Fleet	0	181.69	736.84	0	183.65	421.89
Asiatic Fleet	0	244.90	480.00	150.37	423.79	886.23
Miscellaneous: [2]						
Battle Fleet	0	113.69	863.31	0	109.90	264.98
Scouting Fleet	0	146.28	600.00	0	127.19	292.68
Asiatic Fleet [1]	0	230.05	827.59	0	294.84	972.97
Naval Forces, Europe	0	211.33	699.03	0	206.51	350.13
Special service squadron, based on Panama	0	165.96	355.03	150.82	203.24	251.31
Naval transportation service	22.10	187.80	400.00	85.79	160.96	357.50
Special duty	0	188.15	617.28	41.24	164.39	364.78
Miscellaneous and district vessels	0	176.67	972.97	16.83	212.63	396.40

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates, etc.*—Continued.

	Annual rate per 1,000 Feb. 3, to Mar. 1, 1924.			Average rate since Jan. 1, 1924.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All naval districts in the United States	0	57.25	538.22	0	60.73	281.69
First naval district	0	41.57	91.02	12.10	45.93	205.71
Third naval district	0	33.82	78.85	11.76	38.16	55.48
Fourth naval district	0	10.03	19.88	9.50	46.30	81.26
Fifth naval district	0	62.92	116.85	0	68.82	119.40
Sixth naval district	62.53	79.83	211.38	57.37	70.96	215.13
Seventh naval district	0	0	0	0	0	0
Eighth naval district	0	0	0	0	25.65	29.47
Ninth naval district	51.26	51.26	51.26	71.96	71.96	71.96
Eleventh naval district	25.05	36.92	47.45	34.58	52.58	52.17
Twelfth naval district	47.40	88.93	178.08	33.55	90.71	209.56
Thirteenth naval district	0	219.03	539.22	39.47	124.93	281.69

RATIO OF GONOCOCCUS AND SYPHILIS INFECTION TO TOTAL CASES OF VENEREAL DISEASES.

	Per cent, January, 1924.		Per cent since July 1, 1923.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All ships	72.46	9.37	67.42	9.26
Battleship divisions—				
Battle Fleet	80.44	9.33	84.56	9.66
Scouting Fleet	88.98	1.69	75.58	6.06
Asiatic Fleet [1]	56.00	18.00	40.78	16.13
Destroyer squadrons—				
Battle Fleet	75.86	17.24	87.15	6.88
Scouting Fleet	75.00	4.69	65.98	5.02
Asiatic Fleet [1]	56.46	27.03	49.08	9.51
Miscellaneous [2]—				
Battle Fleet	75.55	16.33	83.04	10.73
Scouting Fleet	75.90	6.02	65.85	11.95
Asiatic Fleet [1]	51.35	5.40	50.00	13.50
Naval forces, Europe	60.00	5.00	56.17	9.45
Special service squadron, based on Panama	69.23	23.08	55.94	7.69
Naval transportation	57.14	10.20	60.83	6.94
Special duty	59.32	10.17	67.36	5.86
Miscellaneous and district vessels	61.54	7.69	60.13	10.13

	Per cent, Feb. 3 to Mar. 1, 1924.		Per cent since Jan. 1, 1924.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All naval districts in the United States	80.53	8.85	82.51	7.98
First naval district	90.91	9.09	85.71	3.57
Third naval district	100.00	0	100.00	0
Fourth naval district	100.00	0	90.00	10.00
Fifth naval district	77.50	5.00	78.49	8.60
Sixth naval district	84.61	15.39	84.62	7.69
Seventh naval district	0	0	0	0
Eighth naval district	0	0	100.00	0
Ninth naval district	80.00	0	87.50	6.25
Eleventh naval district	77.78	22.22	76.92	15.28
Twelfth naval district	63.64	0	80.00	4.00
Thirteenth naval district	82.35	17.65	80.95	14.29

[1] Month of December, 1923.
[2] Vessels of train, base, air squadrons, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 4.—*Number of admissions reported by Form F cards and annual rates per 1,000, entire Navy, for the four-week period February 3 to March 1, 1924, inclusive.*

	Navy (strength, 97,042).		Marine Corps (strength, 21,238).		Total (strength, 118,280).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases of blood	0	0	1	0.61	1	0.11
Diseases of circulatory system	47	6.30	9	5.51	56	6.15
Diseases of digestive system	302	40.46	68	41.52	370	40.66
Diseases of ductless glands and spleen	8	1.07	2	1.22	10	1.10
Diseases of ear	374	50.10	61	37.34	435	47.81
Diseases of eye and adnexa	43	5.76	16	9.79	59	6.48
Diseases of genito-urinary system (non-venereal)	116	15.54	17	10.41	133	14.62
Communicable diseases transmissible by oral and nasal discharges (A)	539	72.20	82	50.19	621	68.25
Communicable diseases transmissible by oral and nasal discharges (B)	1,073	143.74	155	94.88	1,228	134.96
Communicable diseases transmissible by intestinal discharges	10	1.34	1	.61	11	1.21
Communicable diseases transmissible by insects and other arthropods	39	5.22	88	53.87	127	13.94
Tuberculosis (all forms)	25	3.35	2	1.22	27	2.97
Venereal diseases	898	120.30	194	117.53	1,092	120.01
Other diseases of infective type	251	34.70	34	20.81	285	31.32
Diseases of lymphatic system	40	5.36	11	6.73	51	5.60
Diseases of mind	49	6.56	14	8.57	63	6.92
Diseases of motor system	89	11.92	23	14.08	112	12.31
Diseases of nervous system	25	3.35	5	3.06	30	3.30
Diseases of respiratory system	79	10.58	20	12.24	99	10.88
Diseases of skin, hair, and nails	56	7.50	14	8.58	70	7.69
Herniae	47	6.30	7	4.28	54	5.93
Miscellaneous diseases and conditions	102	13.66	27	16.53	129	14.18
Parasites (fungi and certain animal parasites)	89	11.92	14	8.57	103	11.32
Tumors	16	2.14	2	1.22	18	1.98
Injuries	454	60.82	64	39.18	518	56.93
Poisoning	6	.80	4	2.45	10	1.10
Dental diseases and conditions	12	1.61	3	1.84	15	1.65
Total	4,789	641.53	938	574.16	5,727	629.40

TABLE No. 5.—*Deaths reported, entire Navy, for the four-week period, February 3, to March 1, 1924, inclusive.*

Causes.	Navy (strength, 97,042).	Marine Corps (strength, 21,238).	Total (strength, 118,280).
Abscess, entamebic, liver	0	1	1
Meningitis, cerebrospinal	1	0	1
Diphtheria	1	0	1
Influenza	1	0	1
Measles	7	0	7
Pneumonia, broncho	1	0	1
Pneumonia, lobar	2	0	2
Tuberculosis, chronic pulmonary	5	0	5
Syphilis	1	0	1
Other diseases	2	1	3
Drowning	5	0	5
Other accidents and injuries	6	5	11
Total	32	7	39
Annual death rate per 1,000, all causes	4.29	4.28	4.25
Annual death rate per 1,000, disease only	2.81	1.22	2.51

83393—24——8

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

Medical Lib

VOL. XX NO. 5

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

MAY, 1924

(MONTHLY)

Compiled and published under authority of Naval Appropriation Act for 1924
approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE OF CONTENTS.

Page.

PREFACE v

NOTICE TO SERVICE CONTRIBUTORS vi

SPECIAL ARTICLES:

MEDICAL DEPARTMENT OF THE MARINE CORPS, EAST COAST EXPEDITIONARY FORCE, DURING THE FALL MANEUVERS OF 1923, AN ACCOUNT OF.

By Lieut. Commander W. Chambers, Medical Corps, U. S. N. 531

PYELOGRAPHY.

By Commander W. S. Pugh, Medical Corps, U. S. N. (ret.) 559

HYDRONEPHROSIS.

By Lieut. (J. G.) R. B. Engle, Medical Corps, U. S. N. 567

BICHLORIDE OF MERCURY POISONING WITH CALCIUM SULPHIDE AS A CHEMICAL ANTIDOTE—A PRELIMINARY REPORT OF THE TREATMENT OF.

By Lieut. J. M. McCants, Medical Corps, U. S. N. 572

CONSTRUCTION OF VULCANITE PARTIAL DENTURES.

By Lieut. L. M. Desmond, Dental Corps, U. S. N. 578

CLINICAL NOTES:

CHRONIC DUODENAL ULCER.

By Lieut. (J. G.) O. A. Smith, Medical Corps, U. S. N. 581

MALIGNANT ENDOCARDITIS FOLLOWING FRACTURE OF THE RIBS, A CARE REPORT.

By Lieut. (J. G.) B. M. Summers, Medical Corps, U. S. N. 586

INCONTINENCE OF URINE.

By Lieut. (J. G) E. M. Harris, jr., Medical Corps, U. S. N. 591

REPORT OF A DEATH OCCURRING DURING TREATMENT FOR LEPROSY WITH CHAULMOOGRA OIL DERIVATIVES.

By Lieut. F. L. McDaniel, Medical Corps, U. S. N. 594

NOTES AND COMMENTS:

German hospital ship during the World War—Misconduct ruling 597

NAVY NURSE CORPS:

Notes on dietetics taken at Miss Farmer's School of Cookery, Boston, Mass. 605

INSTRUCTIONS ISSUED BY THE BUREAU OF MEDICINE AND SURGERY:

Patients suffering with tuberculosis or neuropsychiatric diseases and conditions who are veterans of the Spanish-American War, Boxer Rebellion, and the Philippine Insurrection, now under treatment but who are not beneficiaries of the Veterans' Bureau as veterans of the World War, and who are not at present members of the regular military and naval establishments—Hospital Corps Handbook, U. S. Navy, 1923, issue of—Adoption of revised Nomenclature of Diseases and Injuries, Medical Department, U. S. Navy—Classified expenditures and per diem cost in naval hospitals (continental), during the quarter ending September 30, 1923—Paragraphs 1280 and 1281, Naval Courts and Boards, 1923—Epidemiological study of

INSTRUCTIONS, ETC.—Continued. Page.
influenza, the common cold, and other respiratory disorders, now being carried on by the U. S. Public Health Service, request for cooperation by medical officers of the Navy—Influenza, the common cold, and other respiratory disorders—Schedule of wages for civilian employees, effective January 1, 1924—Laboratory courses for nurses of the U. S. Navy—Enlistment of men not physically qualified—Administration of triple antityphoid vaccine—Classified expenditures and per diem cost in naval hospitals (continental), during October, 1923—Form F cards in cases of patients taken up as from change of diagnosis—Form "X"—Abstract of enlistments—Addition of diagnostic title number 1973, "Urticaria," to Navy Nomenclature of Diseases and Injuries—Care in handling concentrated spirit of nitrous ether—Equalization bill—Modification of present allotment system—Instrument, plastic filling, Black's, Nos. 1 to 7, addition to Supply Table, Part II—Assignment of light duty to hospital patients—Form N. M. S. H. C. 3, forwarding of, in the case of hospital corpsmen whose records have been closed for desertion and convicted of absence without leave, or absence over leave, or restored to duty—American Red Cross—Disciplinary regulations referring to beneficiaries of the U. S. Veterans' Bureau in naval hospitals—Complement fixation tests for syphilis—Transportation of insane patients—Closer relation between medical officers on recruiting duty and the Bureau of Medicine and Surgery—Memorandum for medical officers on recruiting duty—Applicants for appointment in the Navy Nurse Corps, physical examination of—Change in the Manual of the Medical Department 617

BOOK NOTICES 653

PREVENTIVE MEDICINE, STATISTICS:
Resuscitation apparatus—Follow-up treatment of syphilis—Accident statistics; injuries and poisonings—Methods used in the prevention and control of communicable diseases at the naval training station, Hampton Roads, Va.—Venereal disease experience of the U. S. S. *Detroit* during her "shakedown" cruise—Typhoid fever report—Eradication of vermin; note from the Marine Barracks, Washington, D. C.—Food poisoning—Improved sanitary quality of foods now marketed compared with conditions ten years ago, as observed in Detroit—Physiological effects of high temperatures and high relative humidity—Supplementary report on tentative bacteriological standards for swimming pools in Detroit—Correct reporting of cases remaining at the end of the calendar year 1923 659

PREFACE.

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest published medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form, such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX. MAY, 1924. No. 5.

SPECIAL ARTICLES.

AN ACCOUNT OF THE MEDICAL DEPARTMENT OF THE MARINE CORPS EAST COAST EXPEDITIONARY FORCE DURING THE FALL MANEUVERS OF 1923.

By W. CHAMBERS, Lieutenant Commander, Medical Corps, United States Navy.

In the following account of the Medical Department of the Marine Corps, East Coast Expeditionary Force, during the maneuvers of 1923, it is desired to describe a few of the problems of preparation and organization and to give a brief description of its activities in the field. To do this it is necessary first to describe some of the conditions which materially influenced the conduct throughout the whole period.

The exercises were undertaken primarily to train the expeditionary force. For this purpose the following general situation was simulated in the basic plan:

"The territorial limits of Virginia and West Virginia constitutes a weak overseas state, (Red): between STAUNTON (the capitol) and HARRISONBURG are many foreign owned oil wells; internal disorders and a threatened revolution, jeopardizing lives and property of foreigners, causing a strong Blue State to intervene. The Blue State accordingly dispatched a Marine Corps Expeditionary Force, which landed at Quantico, to march inland on STAUNTON in support of the constituted Red Government and to protect foreign property.

"Numerous bands of Red Irregulars, estimated at about 7,000 men, whose sympathies are toward a revolution, are scattered throughout the country.

"Red Regular troops, about 2,000 Infantry and three batteries of light artillery are in STAUNTON.

"SPECIAL SITUATION (BLUE)

"The Blue Marine Corps Expeditionary Force consists of:

"Force Headquarters and Headquarters Company.

"Military Police Company.

"3rd Signal Company (less detachments).

"Force Air Service.

"Engineer Company.

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

" Gas Company.
" Medical Battalion.
" 5th Regiment, Infantry.
" 10th Regiment, Field Artillery (Motorized).
" 6th Regiment, Infantry.
" Force Train and Service Company.
" NOTE.—The 6th Regiment, to which is attached 1 Bn. 10th Regiment and dets. 3rd Signal Company, guards the base at QUANTICO and the line of communication."

With this mission in mind the problems of the Medical Department, aside from that of preparing the personnel of the whole force for field service, may be grouped as follows: (*a*) Organization and equipment; (*b*) health conditions in Virginia; (*c*) hospitalization.

In planning the organization provision had to be made for sufficient personnel to carry on the routine functions of the post, while the remainder had to be divided between the combatant units and a medical battalion. The number remaining on the post was of necessity so small that plans had to be made to evacuate most of the patients from Quantico, to the naval hospital at Washington, D. C. Those serving with combatant units were easily arranged along old familiar lines, but a medical battalion presented more difficulties, as it was planned to organize this unit with medical personnel throughout.[1] This decision materially increased our problems for it added new responsibilities in training.

The medical battalion was intended to perform the same general functions for an expeditionary force of marines that a medical regiment of the United States Army does for a division, namely, collection, transportation, and temporary hospitalization of disabled men. In this instance, however, the medical battalion would have to assume additional functions, namely, evacuation to its rear and possible definitive hospitalization.

Early in the year a tentative table of organization for a medical battalion was presented to the Bureau of Medicine and Surgery for

[1] In order to determine the operation of a medical battalion under field service conditions all the personnel of the organization during these maneuvers consisted of hospital corpsmen. It was demonstrated that these units as organized could satisfactorily perform the task assigned. As hospital corpsmen are not expected to ordinarily perform duties outside of their professional training, the Marine Corps will furnish the personnel as shown by Organization Table No. 18, U. S. M. C., approved by the Bureau of Medicine and Surgery. This Medical Department organization will not be provided unless the personnel of the independent Infantry Brigade or the Marine Corps Expeditionary Force comprises 6,000–8,000 men, or the character of the operations at a distance from the base demands the evacuation facilities furnished by the medical battalion. The Medical Department units with combat organizations, as shown by the approved organization tables of the U. S. Marine Corps, will provide a sufficient number of medical officers and hospital corpsmen for ordinary circumstances. The new medical equipment provides for brigade, regiment, and battalion. It is not to be used except as the instructions indicate. The full equipment for a brigade accompanies the medical battalion, which for the purpose of mobility when operating in the interior, may only comprise certain articles of this equipment.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

its approval or disapproval. In this table all units had been reduced to the minimum strength considered capable of fulfilling their functions on this particular maneuver, but it was not sufficiently flexible to cover all situations of actual combat. These reductions below normal were necessary because of the limited personnel available. All the essential elements were retained, comprising a headquarters group, a service company, and three companies for collection, transportation and temporary hospitalization, known as the sanitary, ambulance, and hospital companies, respectively. Chart A shows this organization graphically. The sanitary company and the hospital company were reduced to two platoons instead of the normal of three each.

Early in June several barrack buildings were assigned to house the medical battalion and shortly afterwards the first company was assembled to form the nucleus of the battalion. In the meantime hospital corpsmen were working in a near-by mess for instruction in cooking, while others had been sent to the motor repair shop and corral for appropriate training.

A company mess was started when sufficient men arrived to warrant it and shortly afterwards the provisional company was divided to make up all the units of a battalion, one mess continuing to serve the whole battalion.

From this time until the date set for departure, all effort was confined to completion of organization and equipping of each unit. Very fortunately the new field equipment had just been received from the naval medical supply depot, Brooklyn, N. Y., and it represented a very marked advance. It was readily arranged throughout the force and greatly facilitated the functioning of all units during the maneuver.

During these days crowded with many details of preparation, all hands turned to with the utmost energy and cheerfulness, and by the time set for departure were fully organized and ready to march. We were dependent upon the actual march to provide the necessary training we had been unable to acquire in camp because of limited time available. This hope for an opportunity to shake down in the field was shattered early on the march because of the unusual weather conditions encountered. In addition to the regular training we had organized and trained two companies of hospital corpsmen to serve as Infantry in the reenactment of the Civil War Battle of New Market, Va.

While these preparations were under way Lieut. W. W. Hall, (M. C.), United States Navy, was sent to make a medical reconnaissance of the whole maneuver area. He traveled to Lexington, Va., via Brentsville, Culpeper, Orange, Gordonsville, Basic City, and Staunton, Va., returning by way of Fort Defiance, Winchester,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and Berryville, Va., to Washington, D. C., and from there to Quantico, Va. He gave particular attention to the possible water sources of each camp site and civil hospital facilities.

As the water was found as a rule heavily polluted with surface drainage, it was recommended that the United States Army mobile filtration and chlorination plant be secured for field use. This unit proved to be most valuable, for the water supply in most instances, in addition to being heavily polluted, carried a yellow pigment, as the result of the recent heavy rains, which could not be removed by ordinary methods of field filtration. The usual provision for the water chlorination bag was made in addition.

During the reconnaissance Lieutenant Hall inquired into the civil hospital facilities with a view to their possible use if the circumstances warranted it. In this connection it is necessary to recall that during the summer months, certain diseases were present in Virginia in epidemic form, of these infantile paralysis was present in the counties surrounding Quantico; "Devil's Grippe" was reported by the health authorities and was presumed to be a form of influenza. In addition to the above bacillary dysentery was reported along the middle branch of the Rappahannock River.

Our general plan to meet the situation outlined above was naturally first of all to do everything possible to prevent disease, but in addition we had to consider the possibility of the entrance of a disease in epidemic form. An epidemic disease in the force with such a long line of communication as would exist would tend to immobilize the Medical Department unless a scheme of evacuation could be maintained at all times. Plans were therefore made for the evacuation of all disabled men to Quantico, or to the Naval Hospital at Washington, D. C., by ambulance, plane, or rail, and if this were interrupted, to use civil hospitals where possible.

In addition, however, extra hospital equipment was carried in the medical battalion, with the intention of mobilizing a part of it with sufficient personnel when circumstances would require such action. For instance if the evacuation were interrupted at a point distant from a civil hospital, we had sufficient extra material to carry on until evacuation could be effected. The personnel would have to be detached from the force, it being intended that the medical battalion as a unit would continue to advance with the main body. In this connection it is necessary to remember that in the event of any serious epidemic, the civil hospitals would naturally be occupied in caring for the civil population. This situation could easily have been met, had it been possible to organize the semimobile evacuation hospital, shown in chart B, so designated to avoid confusion with that of a base hospital which is ordinarily established by other elements of an expeditionary force.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

To facilitate coordination of the various departments of the force the following memorandums were presented to the A. C. of Staff, F–1:

OFFICE OF THE FORCE SURGEON,
MARINE CORPS EXPEDITIONARY FORCE.
Quantico, Va., 25 June, 1923.

MEMO. TO A. C. OF STAFF, F–1, M. C. E. C. EXPEDITIONARY FORCE.

Subject: Tentative scheme for the use of the Medical Battalion, during coming maneuvers, *re* camp sanitation, march collection, hospitalization and evacuation to Base Hospital, etc.

Reference: (a) A. C. of Staff, F–1, Memo., 22 June, 1923.

1. In accordance with reference (a) the following tentative scheme is herewith submitted:

(A) The general purpose is to supervise sanitation; to provide for collection, evacuation, and hospitalization of sick and injured; and to resupply the medical units of the whole force. For this purpose the medical battalion is divided into a headquarters and four companies, viz, Service, Sanitary, Ambulance, and Hospital Companies.

(a) **The Headquarters** will set up near the hospital station and will establish a message center.

(b) **The Hospital Company** has two complete sections capable of separate function.

During combat and maneuvers it will establish a hospital station near Force Headquarters for the reception and treatment of sick and injured personnel.

On the march these sections will "leap frog" each other, providing hospitalization at all times, returning recovered patients to their units, evacuating all others except those not in condition for long transport, via motor truck, airplane, ambulance or rail to Marine Barracks, Quantico, Va., and the Naval Hospital, Washington, D. C. (In the event that sufficient personnel become available in time, it is proposed to organize an Evacuation Hospital (semipermanent) as a rear echelon of the Medical Department with the field force, to take care of nontransportable cases. If the organization of this unit is not completed, it is proposed to use the best civil hospitals available for nontransportable cases.)

In camp the hospital company will establish a hospital station for the complete hospitalization of all cases.

(c) **The Service Company** contains a headquarters and four sections. This company will also mess the sanitary and ambulance companies and provide an advance group for the purpose of marking camp sites.

The Staff Section provides clerical force for the force surgeon's office and that of the battalion headquarters and keeps all records and reports.

The Medical Supply Section will carry a limited resupply of medical and surgical material and will, when needed, obtain a resupply from rail refilling stations. It will establish a medical supply dump in the vicinity of the hospital station and will distribute necessary medical and surgical supplies to all medical units of the expeditionary force, by the use of motor trucks, ambulances or mule pack.

The Quartermaster Supply Section will secure and distribute quartermaster supplies to the units of the medical battalion.

The Laboratory Section will serve all the medical units of the Force and will normally set up at the hospital station.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

If during the maneuver period combatant units are separated in very small groups, resupply of medical and surgical material will be made by mule pack and through the air service, while evacuation will be made by hand litters or litters on Cole carts or when practicable by ambulance or plane.

(d) **The Sanitary Company** is divided into two platoons, each with a collecting station section and a litter bearer section.

In camp the sanitary company will *supervise* the sanitation of the whole force area and will provide guards when necessary for the units of the medical battalion.

On the march one platoon will establish march collecting stations at designated halts.

In maneuvers simulating combat this company will establish one or more collecting stations behind the line and evacuate wounded by litter and Cole carts from aid stations of combatant units, when it is not practicable to use ambulances so far forward.

(e) **The Ambulance Company** is divided into three sections, the first animal-drawn and the second and third motorized.

In camp they will evacuate sick and wounded from regimental dispensaries at regular periods to the station hospital.

On the march the animal-drawn section will cover the rear of each regiment, transporting casualties to the next march collecting station.

The motor sections will evacuate march collecting stations after the column has passed.

During maneuvers simulating combat this company will establish an ambulance control station behind the collecting station and evacuate casualties from there to the hospital stations. In addition it will carry necessary medical and surgical resupplies forward from the medical supply dump to the medical detachments with combatant units.

It will also be necessary to provide evacuation of casualties from the hospital station at certain times in accordance with the plan outlined above under the hospital company, to allow the units of the hospital company to remain mobile.

(f) It is proposed to augment this evacuation scheme when necessary by request to F–4 for the assignment of trucks at designated points (casualty truck head) to evacuate slightly wounded to the hospital station.

(g) Evacuation to the rear of the hospital station will be established to the evacuation hospital (if organized in time) or to the rail refilling stations for rail transportation to Sick Quarters, Quantico, Va., or to the Naval Hospital, Washington, D. C., or civil hospitals as above outlined, paragraph (*b*).

(h) In the event of an unusual (simulated) number of casualties during the maneuvers, it is proposed to requisition additional troops (bandsmen) as litter bearers.

NOTE.—If sufficient Navy personnel and quartermaster equipment (2 motor trucks, 1 trailer kitchen, and 1 trailer tank) become available it is also proposed to increase the sanitary and hospital companies each by one additional platoon to serve as a reserve. The medical equipment for these additional units is available.

W. CHAMBERS, *Force Surgeon.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

OFFICE OF THE FORCE SURGEON,
MARINE BARRACKS, QUANTICO, VIRGINIA,
23 July, 1923.

MEMORANDUM FOR ASSISTANT CHIEF OF STAFF, F–1, M. C. E. F.

Subject: Man power, conservation of.
Reference: (a) F–1 Annex.

1. In accordance with reference (a) there is submitted herewith a brief discussion of the above-named subject, with an outline of the Medical Department plan of action.

W. CHAMBERS, *Force Surgeon.*

SANITATION AND HYGIENE.

A. Preparation for maneuvers:

(a) *Personal hygiene—*

All men taking part in the forthcoming maneuvers should be instructed in the importance of personal cleanliness which includes the following:

Bathing of the body.
Scrubbing of the teeth.
Frequent change into clean clothing.

(b) *Care of the feet—*

Shoes should be fitted to the feet of each man and should be well "broken in" for field use.

Each man should be supplied with a can of foot powder and he should be instructed in its use.

(c) *Prophylaxis against disease—*

All men should be protected against typhoid and smallpox.

(d) *Permanently physically defective men—*

Permanently defective men should be eliminated from the service at once.

(e) *First-aid, instruction in—*

All men should be instructed by their unit commanders in the elementary principles of first-aid.

(f) *Load to be carried by each man—*

The individual equipment of each man should not exceed 56 pounds in weight.

B. The march:

(a) *The start and finish of the march—*

The start and finish of the march should be slow, "warming up" and "cooling off," otherwise the rate of the march should be as uniform as possible.

Halts should be for a period ten minutes for every hour of the march (all units halting simultaneously). During the halts equipment should be discarded and the men should be encouraged to lie down unless the ground is wet.

The first halt should be early and somewhat longer than ten minutes. During this first halt the men answer the calls of nature, adjust packs, etc. The noon halt should be for one hour and a light noon meal should be served and canteens refilled. The last halt should be well clear of camps for calls of nature and cooling.

All halts must be strictly controlled as regards individuals using their entrenching tools to bury their own feces in circumscribed areas.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(b) *Order of the march—*

The precedence in companies should be rearranged during halts, as the last files get the heat and steam of those ahead. In very hot dusty weather, not more than two men should march abreast of one another.

(c) *Clothing and adjustment during the march—*

Baring the chest reduces the body temperature 0.5° F. Rolling up the shirt sleeves is also of value, and the expansion of the chest should not be restricted by equipment or clothing.

(d) *Food—*

Before the start of the march a light meal should be served. Coffee and a liberal amount of sugar should form a part of this meal. The noon meal should be served after two-thirds of the march has been completed, this meal also should be light. A full meal should be prepared and served at the evening camp, sugar should be served liberally at this meal also.

(e) *Messgear, cleaning of—*

The following procedure should be carried out after each meal for the purpose of cleaning messgear:

The men should form a line and pass a garbage can or pit, where their uneaten food is deposited, after which they pass three cans of boiling water, the first two cans contain boiling soapy water and the other boiling clear water. This method not only cleans the messgear but sterilizes it also and no towel is required to dry the utensils as they dry very readily from the heat of water.

(f) *Water discipline of the march—*

The normal needs should not exceed one quart of water for every seven and one-half miles of marching.

All canteens should be filled with chlorinated water the evening before the march, water tanks should be filled with chlorinated water also the evening before the march.

The responsibility for water supply may be divided as follows:

Responsible for purity of water: Medical officer.

Responsible for quantity and delivery of water: Engineer officer.

Responsible for water guards and distribution of water: Unit commanders.

The conserving area should be 100 yards away and to the leeward of living quarters and remote and downstream from water intake.

(b) *Latrines and urinal soakage pits—*

In temporary camps, straddle trench latrines should be used for defecation and urinal soakage pits should be situated in living areas, if the water supply considerations permit. Dimensions of straddle trench latrines are 1 foot wide, 2 feet deep, and 3 feet long.

Urinal cans plainly marked should be placed in the company streets at night. These cans should be emptied, cleaned, and sunned in the morning.

After defecation each man should cover his own fecal matter. A permanent detail should be responsible for the final closing of the latrines, pits, etc., before or after the troops move out.

In camps of a more permanent nature larger latrines should be constructed with a lengthwise support for the individual and covered if practical with fly-proof covers.

(c) *Manure and refuse—*

Manure and refuse should be hauled from one and one-half to two miles from camps, and to a point distant from through roads leading into camps.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

All water carts and tank trailers should be cleaned at frequent intervals. Canteen tops should be scrubbed frequently and after cleaning should be scalded in boiling water when available.

The use of canteen water should be controlled by unit commanders on the march and the troops should not be allowed to use water from unauthorized sources.

(g) *Lyster bag, use of—*

Lyster bags should be used in camps and should stand one hour after chlorination before the water in them is used. This bag should be hung and covered and the water removed for drinking purposes with a cup through the faucets.

(h) *Socks, shoes, and foot ailments—*

All shoes and socks should be "broken in" before the march, darned socks should not be used.

The following should be carried out after a day's march:

Remove and dry shoes.

Wash, stretch and dry socks, rub until soft.

Wash feet in cold water and dust with foot powder.

Put on clean socks and dry shoes.

Blisters and other ailments of the feet will be treated by the Medical Department.

C. In camp:

(a) *Camp sites—*

If circumstances permit, camp sites should be selected after considering the sanitary conditions of the site.

The living, conserving, and transport area should be separate in each camp and in each unit.

1. Tent sites: Bedding and equipment should be sunned and aired at least twice weekly.

2. Roads: Roads through camp should be established and men and animals should travel on them exclusively, as far as circumstance permit.

3. Food in camp: Food should not be allowed in camp except at regular mess centers

4. Picket lines: Picket lines should be burned over weekly.

HOSPITALIZATION.

1. Prompt treatment of unfit troops.
2. Reduction of number of sick days.
3. Prevention of venereal disease.

NOTE.—Subjects 1 and 2 are discussed in the Force Surgeon's Memo. of 25 June, 1923, to the Assistant Chief of Staff, F–1, M. C. E. C. Expeditionary Force, and is quoted above.

PREVENTION OF VENEREAL DISEASE.

Attached medical troops will be equipped to give venereal prophylaxis, and in addition prophylactic tubes will be available for distribution to all desiring them.

In addition to the above, unit commanders should advise against venereal exposure.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

When prepared to march the Medical Department of the force was organized as follows:

MEDICAL ATTACHED TROOPS WITH COMBATANT UNITS.

5TH REGIMENT.

4 officers:

Beddoe, A. E., Lt. C. (M. C.), U. S. N., Reg. Surg.
Fetherstone, J. E., Lt. (M. C.), U. S. N.
Sledge, R. E., Lt. (M. C.), U. S. N.
White, S. H., Lt. (M. C.), U. S. N.

31 enlisted.

10TH REGIMENT.

1 officer: Johnson, L. W., Lt. (M. C.), U. S. N., Reg. Surg.
7 enlisted.

ENGINEER BATTALION.

2 enlisted.

1ST AVIATION GROUP.

1 officer: Grosbeck, B., Lt. (M. C.), U. S. N.
2 enlisted.

MEDICAL BATTALION.

Battalion Headquarters:

5 officers—

Chambers, W., Lt. C. (M. C.), U. S. N., Com'd'g and Force Surgeon.
Bacon, S., Lt. C. (M. C.), U. S. N., Executive Officer, Med. Bn.
Shinn, H. L., Lt. (M. C.), U. S. N., Bn. Adj.
Steger, E. M., Lt. (M. C.), U. S. N., Force Sanitary Inspector.
O'Neill, J. B., Lt. (M. C.), U. S. N., Ass't to Force Surgeon.

5 enlisted.

Sanitary Company:

2 officers—

Cloyd, J. A., Lt. (M. C.), U. S. N., Com'd'g.
Noreen, H. A., Lt. (M. C.), U. S. N.

27 enlisted.

Ambulance Company:

1 officer—Davies, W., Lt. (M. C.), U. S. N.
43 enlisted.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Hospital Company:

8 officers—

Jenkins, H. E., Lt. C. (M. C.), U. S. N., Com'd'g.
Robbins, J. H., Lt. (M. C.), U. S. N.
Mathis, M. S., Lt. (M. C.), U. S. N.
Spencer, W. J., Lt. (M. C.), U. S. N.
Hernandez, V., Lt. (M. C.), U. S. N.
Wilson, G. W., Lt. (M. C.), U. S. N.
Soukup, F. K., Lt. (j. g.) (M. C.), U. S. N.
Johnson, H. D. Lt. C. (M. C. D. S.), U. S. N.

40 enlisted.

Service Company:

Company Headquarters—

2 officers—

Gaither, A. L., Lt. (M. C.), U. S. N., Com'd'g.
Quinn, G. P., Lt. (M. C.), U. S. N.

29 enlisted.

Staff Section—

1 Pharmacist: Stanley, R. H., Pharmacist, U. S. N.

3 enlisted.

Medical Supply Section—

1 enlisted.

Quartermaster Supply Section—

4 enlisted.

Ordinarily, however, the medical battalion would be organized in accordance with the following table:

ORGANIZATION TABLE No. 18.—*Medical Battalion, U. S. Marine Corps.*

1	2	3	4	5	6	7	8	9	10
Units.	Battalion Headquarters.	Service Company.				Collecting Company.	Ambulance Company.	Hospital Company.	Total for battalion.
		Staff Section.	Laboratory Section.	Medical Supply Section.	General Supply Section.				
Commissioned.									
Medical officers	[a] 1								1
Lieutenant Comdr., U. S. N.	[a b] 1		1			1	1	[f] 5	9
Lieutenants, U. S. N.						1	1	6	8
Lieutenants, (J. G.,) U. S. N.									
Marine officers									
Capt. quartermaster					[c] 1				1
Total commissioned	2		1		1	2	2	11	19
Warrant officers.									
H. C., U. S. N.		1		1					2
Marine gunner					[d] 1				1
Total warrant officers		1		1	1				3

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ORGANIZATION TABLE No. 18.—*Medical Battalion, U. S. Marine Corps*—Contd.

1	2	3	4	5	6	7	8	9	10
Units.	Battalion Headquarters.	Service Company.				Collecting Company.	Ambulance Company.	Hospital Company.	Total for battalion.
		Staff Section	Laboratory Section.	Medical Supply Section.	General Supply Section.				
Enlisted medical personnel.									
Total		3	2	4		58	27	58	152
C. Ph. mates		(1)		(1)		(1)	[a] (1)	(1)	5
Ph. mates, 1st class		(1)	(1)	(1)		(3)	(2)	(3)	11
Ph. mates, 2d class		(1)							1
Lower ratings			(1)	(2)		(54)	(24)	(54)	135
Enlisted Marine Corps.									
Personnel, total					75				75
1st sergeant (acting)					(1)				1
Sergeants					[e] (1)				1
Privates					(73)				73
Orderlies, mounted					(2)				2
Chauffeurs					(17)		[g] (16)		33
Asst. chauffeurs					(8)				8
Clerks					(1)				1
Cooks					(3)				3
Asst. cooks					(3)				3
Tent pitching squad, Guard and General Supply Section					(10)				10
Drivers							[g] (5)		5
Asst. drivers							[g] (5)		5
Mechanics					(3)				3
Total enlisted, U. S. N. and U. S. M. C.		3	2	4	75	58	27	58	227
Aggregate	2	4	3	5	77	60	29	69	249
Ambulance, motor							16		16
Ambulance, animal-drawn							4		4
Bicycle					1	1	1	1	4
Cars, motor					1				1
Horses, riding					4				4
Motor cycle, 3 / side car					4				4
Mules							20		20
Trailer, lightning unit					1				1
Trailer, kitchen					3				3
Trailer, spare parts					1				1
Trailer, tank					3				3
Truck, ¾-ton					4				4
Truck, 3½ ton					8				8
Wagon, escort							1		1

[a] Mounted.
[b] Battalion adjutant.
[c] Battalion quartermaster, commanding officer of Service Company, Battalion mess officer.
[d] Transportation officer.
[e] Mess sergeant.
[f] Dental officer.
[g] On detached duty from Service Company.

THE MARCH.

On the evening of August 26, 1923, every preparation possible had been made for the march through Virginia. At an early hour the following day Lieutenant Robbins with the second platoon of the hospital company, forming the forward echelon of the Medical Department, cleared Quantico and was on his way to Camp No. 2, about 1 mile west of Brentsville, Va. This disposition was made in order to allow more time for the establishment of the first hospital station.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It was intended to use Quantico for the reception of any patients evacuated up to the time of the beginning of the second day's march. As the situation developed on the second day, this arrangement proved to be very advantageous, for weather conditions and very muddy roads prevented the heavy trucks from reaching this camp.

In addition to this unit of the hospital company, one platoon of the sanitary company went ahead and established two march collecting stations in the vicinity of points approximately 4 and 8 miles, respectively, of Quantico, Va. Elements of the animal-drawn section of the ambulance company covered the rear of the foot troops, while the motor ambulance sections covered the rear of the whole force and cleared march collecting stations en route. This general scheme was followed throughout the whole march.

Field Orders No. 1 (1) shows the disposition of the whole force. The following medical order, supplementary to the force field order, was issued and illustrates the method used throughout to coordinate the Medical Department:

HEADQUARTERS U. S. MARINE CORPS EXPEDITIONARY FORCE,
OFFICE OF THE FORCE SURGEON,
26 August, 1923—10.00 a. m.

Field Orders No. 1.

Maps: U. S. G. S. 1: 125000, Mt. Vernon Sheet.

1. The Marine Corps Expeditionary Force (less the 6th Marines and 10th Regiment Marine Artillery) will march via the QUANTICO-TRIANGLE-JOPLIN-HOLMES CENTER road to camp site on QUANTICO CREEK, on 27 August, 1923.

2. The 1st Medical Battalion, M. C. E. F., will accompany the force and provide collection, temporary hospitalization, and evacuation of sick and wounded of the force.

3. *a.* The Sanitary Company (less the collecting station sections) will report to the truckmaster for assignment in the train. The commanding officer of the Sanitary Company will assign two collecting station sections plus one motor ambulance to clear CR. POST GARAGE at 6.30 a. m. 27 August, 1923. A march collecting station will be established along the route of march in the vicinity of one mile N. W. of TRIANGLE and another march collecting station will be established in the vicinity of 400 yards N. W. of R. J. 250.

3. *b.* The Ambulance Company (less special detachments) will report to the truckmaster at 6.00 a. m., 27 August, 1923, for assignment of position in the train.

The commanding officer Ambulance Company will assign three animal-drawn ambulances to report to the Regimental Surgeon, 5th Regiment, at 6.00 a. m., 27 August, 1923, for duty with that regiment.

The commanding officer Ambulance Company will assign one motor ambulance to the commanding officer of the Sanitary Company at 6.25 a. m., 27 August, 1923, for duty with the 1st collecting station section.

The Ambulance Company will evacuate forward from the collecting station all men who are only temporarily incapacitated. Seriously ill patients will be evacuated to Sick Quarters, Quantico, Va.

In camp, ambulance will call at each dispensary one hour after sick call.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

3. *c.* The Hospital Company (less the 2nd platoon) will report to the truckmaster at 6.00 a. m., 27 August, 1923, for assignment of position in the train.

The 2nd platoon of the Hospital Company will clear CR. POST GARAGE by 6.25 a. m., 27 August, 1923, and proceeding over the TRIANGLE-JOPLIN-INDEPENDENT HILL-BRENTSVILLE-NOKESVILLE road, will establish a hospital station on the HENDRICK FARM in the vicinity one-half mile beyond BRENTSVILLE.

4. *a.* The commanding officer Service Company is designated Truckmaster. The Service Company will be assigned position in the Force Train.

The Service Company will furnish a hot meal to the medical battalion (less the 2nd platoon Hospital Company) at noon, 27 August, 1923.

The Service Company will draw ice, bread, and commissaries at 2.30 p. m., 27 August, 1923, and distribute to the medical battalion.

The commanding officer Service Company will designate one field kitchen with cook and second cook to join and accompany the second platoon of the Hospital Company by 6.00 a. m., 27 August, 1923.

The commanding officer Service Company will establish a message center in accordance with F–1 annex to Basic Plan.

4. *b.* Ambulance route will be over the JOPLIN-TRIANGLE-QUANTICO road. Patients will be evacuated to Sick Quarters, Marine Barracks, Quantico, Va.

5. *a.* The Force Surgeon may be found with the Force Headquarters group at the head of the column.

5. *b.* Communication will be maintained by the battalion message center through the force message center.

W. CHAMBERS, *Force Surgeon.*

Distribution:

Chief of Staff, 1.
A. C. of S. F–1, 1.
A. C. of S. F–2, 1.
A. C. of S. F–3, 1.
A. C. of S. F–4, 1.
C. O. Hospital Co., 3 (1 for C. O., 1 for each section).
C. O. Service Co., 3 (1 for C. O., 1 for commissary section, 1 for laboratory section).
C. O. Sanitary Co., 1.
C. O. Ambulance Co., 1.
Battalion Hdqtrs., 1.

The first camp site, "Dewitt Farm," just across Quantico Creek, about 10½ miles from the base, was reached shortly after noon on the first day. The mobile filtration plant was set up and operated in a very satisfactory manner. In this connection it may be added that this unit was checked by a bacteriological examination which proved entirely satisfactory. The water from Quantico Creek showed evidence of pollution, as did the majority of water sources during the whole march.

The next day being clear and pleasant, the march was begun with every expectation of an easy hike. The field orders for the day (3) made the usual disposition of the force. March collecting stations were established at approximately 4-mile intervals, while a hospital

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

station was already set up at the camp site ahead. Late in the forenoon rain began to fall and soon changed the very dusty roads into deep muddy stretches. Word soon reached force headquarters that the heavy transportation could not proceed except with the utmost difficulty, it being necessary to pull each truck in turn out of the ditch every few yards. The field orders were modified at once, the foot troops being sent ahead to camp, where they left their packs and rifles and returned to the tremendous task of pulling over 100 heavy trucks through the mud. This procedure continued most of the way to Fort Defiance, much of the country being wooded and rolling.

The advantage of having a hospital station set up ahead was now apparent, for otherwise it would have been tied up with all the other heavy trucks. By evening most of the light transportation had reached camp by a detour, while the heavy trucks were still struggling along the main road, Lieutenant Gaither, with those of the medical battalion, leading, about 5 miles from camp. The crew of each field kitchen cooked whatever rations were available and issued them to the nearest troops, while water was secured wherever possible, as the mobile filtration plant was tied up with the other trucks. The hospital station in camp took water from Kettle Run and boiled it, while units on the road secured water from near-by creeks and made it up into coffee.

One of the trucks of the sanitary company disabled at Independent Hill had been unloaded at the side of the road to allow it to be repaired. Repair was effected that evening, and the truck brought up with the train. All effort to move ahead ceased at midnight, as the troops were about exhausted. The struggle was resumed early the following morning, and by evening practically all elements of the force were in the vicinity of camp.

Early the next day the march was resumed, the destination being the "Ennis Farm," on the Nokesville-Catlet Road, about midway between the latter point and Calverton. The usual disposition of the medical battalion was made, one hospital station remaining in position, until the other could get through to the next camp. Patients were evacuated to the rear station, until the forward one opened, the former evacuating its cases by rail to the naval hospital, Washington, D. C. Sufficient ambulances had been left behind for that purpose.

The forward station at Catlet was established before nightfall, and a message dispatched for the other to advance. This was not a very simple procedure, for it was in a bad position, which would require a great deal of effort to get clear of. This was accomplished very successfully, however, and the unit joined the main force

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the next evening at the Rappahannock River just below Remington. Meanwhile the force as a whole made slow progress on the march to the camp beyond Catlet, the last elements not reaching camp until midnight of August 30, by which time there was a shortage of water and a considerable separation of most units from their galleys. A general pool of all rations and water available resulted in every one receiving sufficient for the time.

The march was continued on the following morning, August 31 the destination being the "Currier Farm," just across the Rappahannock River from Remington. As no hospital stations were now in position to go ahead of the main body, a collecting station unit from the sanitary company was sent forward with equipment in light transportation. This disposition would have been necessary at any rate, as all the heavy transportation would have to be pulled across the Rappahannock River beyond Remington, for the bridge at that town could only support light vehicles. The collecting station arrived in good time and very early began to receive patients. In the meantime the main force was struggling with the train at the ford about 2 miles away. That evening several patients were evacuated by plane to Quantico.

No attempt at an advance was made the following day, time being necessary to complete the crossing of the Rappahannock. All patients were evacuated to Washington. However, on the next day, September 2, the march was resumed to the camp site at the fair grounds at Culpeper. This march was accomplished with ease, the whole force arriving at an early hour. The men were paid and liberty was granted that afternoon, several of the faint-hearted taking this opportunity to leave. Needless to say their absence left no void, as it cleared out undesirables and weaklings.

The camp site at Culpeper was well suited for our purpose, good city water being available in abundance. There was an ancient well in the center of the camp which required close guarding, as its waters were clear, cool, and sparkling. It was spoken of with much respect by the natives and apparently had furnished drinking water to many people for many years. Careful examination during the reconnaissance showed it to be badly polluted.

The march from Culpeper to the camp, about 2 miles from Crozet, a distance of about 58 miles, was made in five days without incident except a slight delay at a ford near Cobham. The artillery joined the main force at Orange on September 4, 1923. Patients were evacuated when necessary to clear the hospital stations. After the exposure of the preceding days, a few cases of bronchitis had appeared in the force, but not in sufficient numbers to occasion any concern. Likewise a few injuries had resulted from the intimate struggle with heavy, skidding trucks. Taken as a whole however,

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the force remained remarkably free from sickness, while cases of malingering to avoid marching appeared very infrequently.

From camp No. 9 near Crozet, Va., the force started its march across the Blue Ridge mountains on Sunday, September 9, by way of Afton and Rockfish Gap. All elements of the force reached the next camp at Basic City that evening, having been delayed somewhat by civilian Sunday traffic. The medical battalion established a march collecting station at Afton, while Lieutenant Cloyd stood by at the summit of the mountain road with three ambulances. One platoon of the hospital company as usual established a hospital station in the camp ahead.

By Monday evening, September 10, the last leg of the march into the Staunton-Fort Defiance area had been completed, the force arriving on schedule time at Camp Coolidge, where some preparation had already been made to provide more elaborate accommodation for a large number of distinguished guests. At this camp we had expected to establish a hospital station for definitive treatment, simulating such function on expeditionary duty when all other hospital facilities were lacking, as in the case of occupation of foreign soil when no advance was intended and no hospital ship was present. That portion of the camp allotted for this purpose was so cut up and small that we could set up but a small part of our equipment. The improvised lighting unit was here operated and provided electric current for the field X-ray machine and ordinary illumination. Advantage was taken of this halt to overhaul the transportation and equipment of the medical battalion. Up to the time of arrival in this camp, proper attention had not been given to field sanitation. At this point it became a necessity to strictly enforce sanitary measures. The following order was published throughout the force:

Force Order Number 6.
Reference: F. S. R., 245–246.

1. The following regulations for camp sanitation will govern this command and will be strictly obeyed by all concerned:

(*a*) Lieutenant Commander W. Chambers (M. C.), U. S. Navy, Force Surgeon, is charged with the sanitary service of the Force and the control of the Medical Department in its duties. He will recommend assignments of Medical Department personnel and organizations.

(*b*) Lieutenant E. M. Steger (M. C.), U. S. Navy, is charged, under the direction of the Force Surgeon, with the supervision of the sanitation of the Force. He will keep a record of all inspections, recommendations, and action taken to remedy sanitary defects.

(*c*) Organization commanders are required to remedy sanitary defects. The Sanitary Inspector is required to report sanitary defects directly to organization commanders.

All failures to correct sanitary defects will be reported to the Force commander by the sanitary inspector.

(*d*) Commanding officers will be held responsible for the sanitary conditions of their organization.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(*e*) Men will preserve the utmost possible cleanliness in clothing and person. Bathing after the march will be encouraged. Bedding and equipment will be sunned at least twice weekly.

(*f*) *Water.*—The Military Police, directed by the Force Provost Marshal, will place a guard over the water supply and permit no unauthorized person near it. The use of water from unauthorized sources is prohibited. The engineer officer will provide the water or designate its source.

Water from the portable filtration apparatus will be used when obtainable. The forward echelon of the Force Signal Company will transport one water tank designated by F–4 to be used only for filling of canteens, which will be available upon the arrival of the first troops in camp. All other water must be boiled or chlorinated before use. Muddy water should be filtered by passing it through several layers of cloth, or a clean blanket may be used for this purpose, before chlorination or boiling.

Let water stand at least one hour before drinking.

The taste of chlorinated water may be overcome by vigorously shaking in a canteen.

The bottom of the Lyster bag must be kept at least 15 inches above the ground. The cover should be kept on the bag at all times except when filling.

The use of common drinking cups is prohibited. Organization commanders will instruct their men to use their own canteen cups and to fill them only from the spouts located on the under surface of the Lyster bags. The men will be cautioned not to waste water when filling their canteens.

(*g*) *Food.*—Company cooks' mess equipment and kitchen areas will be kept neat at all times.

(*h*) *Refuse and garbage disposal.*—Food remnants will be scraped into garbage cans or pits, from mess gear immediately after eating of meals. The mess gear will then be washed in boiling soapy water and then rinsed in boiling clean water. For the purpose of washing mess gear, a trench should be dug near the galley and a fire laid in this trench. Two or three cans should straddle the trench, the first should be filled with boiling soapy water, and if three cans are used, the second should also contain boiling soapy water, the other should contain boiling clear water. Having scraped the food from their mess gear, the men file by the cans of boiling water, first immersing their mess gear in the boiling soapy water and then in the boiling clear water. If the water is kept boiling no wiping is required for the heat from the water readily drys the utensils. A man must be detailed to keep the water boiling at all times and change the water in the cans when necessary.

Kitchen refuse will be burned when possible. That which is incombustible will be buried. The keeping in tents of food or rations is prohibited.

Hucksters will not be allowed in camp except for delivery of supplies to the general messes.

Melons will not be brought into camp except for messes.

Garbage will be burned in pits located at least 100 yards from the nearest tent; before leaving these pits must be covered with earth, and crude oil should be sprinkled on this earth. If possible the contents of these pits should be burned over before covering. Tin cans will be beaten out flat and then buried.

Picket lines will be policed twice daily, and manure should be burned or buried.

(*i*) *Excreta disposal.*—Immediately upon arrival into camp, organization commanders will detail sufficient men to dig latrines. Latrines will be dug at least 100 yards away from the nearest tent, and as far as possible away from the galleys. Sufficient straddle trenches will be dug for each organiza-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

tion. Each straddle trench should be 36 inches long, 12 inches wide, and 24 inches deep. The earth should be piled at one end of the trench, and the men should be instructed to cover their excreta with the earth. Toilet paper should be provided. Trenches will be filled in and banked up by organizations before leaving camp. At least one-fourth of the trenches should be kept open until immediately before the departure of the organization. All woods in vicinity of camp sites will be thoroughly policed.

(*j*) *Venereal prophylaxis.*—Tubes for venereal prophylaxis are available at the dispensaries. Organization commanders will have their men instructed in the use of these tubes.

(*k*) *Dispensaries and hospital stations.*—Dispensaries and hospital stations will show a Red Cross Guidon by day and a green light by night.

By command of Brigadier General Butler:

H. N. MANNEY, Jr.,
Chief of Staff.

Official:
D. L. S. BREWSTER,
A. C. of S. F–1.

HEADQUARTERS MARINE EXPEDITIONARY FORCE,
Camp Coolidge, Fort Defiance, Va., 14 September, 1923.

ANNEX NO. 1 TO FORCE ORDER NO. 6—SANITARY REGULATIONS FOR CAMP COOLIDGE.

Latrines:

(*a*) Deep trench latrines will be constructed by each organization. These trenches will be eight feet deep, two feet wide at the mouth, and as wide at the bottom as the ground will permit without caving in.

(*b*) Each organization will provide seating capacity for eight per cent of its personnel.

(*c*) The latrine frames now in use will be rendered fly-proof. The sides and ends of these frames will be closed in with lumber, tar paper, or burlap. A tin strap will be placed along the inside of the front of the box, so as to deflect the urine away from the front of the box.

(*d*) Latrines will be burned out daily with crude oil and straw; for this purpose one gallon of crude oil and 15 pounds of straw or hay will be required for each 20 feet of trench to be burned.

(*e*) The boxes will at all times be kept fly-proof. This implies closure of all cracks, care of hinges and back construction so that the lids drop automatically. The seats will be washed daily with soap and water and washed off twice weekly with a 1–100 cresol.

(*f*) When filled to within 2 feet of the top, latrines will be filled with dirt to within 6 inches of the surface and covered with a layer of burlap soaked in crude oil, to extend 3 feet beyond the edges of the pit. Earth will be banked over by the burlap, the location marked, and new latrines constructed.

(*g*) One man will be detailed to care for each latrine.

(*h*) A urine trough will be constructed to drain into each trench.

Incinerators:

(*a*) Sufficient incinerators will be constructed by each organization to cremate all garbage and waste.

(*b*) A circular pit should be dug, 3 feet in depth and 15 feet in diameter. The bottom should be covered with loose stones to the depth of 14 to 16 inches. On this, around the rim of the pit is built a circular wall to the height of

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

1 foot above the original ground line, and excavated earth packed against it clear to the top, so as to provide a sloping approach and thereby prevent surface water gaining access to the pit. A pyramid of large stones 4 or 5 feet high occupies the center. The surface is essential to provide steady draft and fire.

(*c*) The bottom stones receive the liquid portions of the garbage without affecting the fire and soon evaporate and dissipate these liquids. The solid portions are soon desiccated and become fuel. Care must be exercised to empty the garbage into and not around the incinerator.

(*d*) One man must be detailed to care for each incinerator.

(*e*) One cord of wood will consume approximately 4,500 pounds of refuse-garbage.

By command of Brigadier General Butler:

H. H. MANNEY, Jr.,
Chief of Staff.

Official:
D. L. S. BREWSTER,
A. C. of S. F–I.

Following our arrival in Camp Coolidge near Fort Defiance, orders for the first field problem were published (4).

It divided the Infantry into three groups to occupy the "oil well" area, in readiness to protect property and lives. One group, an Infantry battalion, established headquarters in the vicinity of Piedmont, Va., in readiness to protect the eastern group of oil wells, while another battalion was ordered to the vicinity of Burketown, Va., to protect the northern group, and the third battalion to the vicinity of Springhill, Va., to protect the western group, force headquarters remaining at Camp Coolidge.

Each Infantry battalion was accompanied by medical attached troops and one animal-drawn ambulance from the medical battalion for evacuation to the battalion aid station, while an ambulance control station was established and maintained in Fort Defiance. This station covered the evacuation into the hospital station at Camp Coolidge of the northern and western groups, while the remainder of the ambulance company in Camp Coolidge was ready to evacuate from the eastern group. After these groups were in position they were further divided and subdivided until the whole area was covered, some points being occupied by squads. Casualties were collected by the attached medical personnel of companies and evacuated by the battalion group to the battalion aid station by litter or animal-drawn ambulance and from there by motor ambulance as outlined above.

Upon the completion of this problem, part of the force was ordered to the vicinity of New Market, Va., to prepare for the reenactment of the Battle of New Market. For this purpose the first platoon of the hospital company left Camp Coolidge with the Tenth Regiment of Artillery, the animal section of the train and the animal-drawn section of the ambulance company on Monday, Sep-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tember 17, while on the following day the whole force was moved by motor trucks to the New Market camp, the medical battalion remaining set up at Camp Coolidge with one hospital station established.

After several rehearsals the Battle of New Market was reenacted on the 20th of September before thousands of spectators.

Hospital corpsmen forming two companies of the "First West Virginia Regiment" had a thoroughly good time playing their part in a very realistic manner. Immediately after the show most of the force moved by trucks to Camp Coolidge, the hospital station remaining in position at New Market, and on the following day the force moved to the vicinity of Lexington, Va., where a temporary camp was established. As no hospital units were now available—one being at New Market and the other at Camp Coolidge—a civil hospital was designated as the hospital station for any emergency. That night one patient was evacuated directly into the civil hospital from the scene of a collision on the road but was removed the following day and evacuated to the hospital station at Camp Coolidge.

The hospital station left at New Market after the reenactment of the battle lost a considerable amount of property during a severe rainstorm at night. In establishing the station Lieutenant Spencer had been forced to use a ravine to properly conceal this too modern establishment from the view of spectators. The patients and personnel of this station were awakened during the night just in time to see a real "washout" carrying personal and Government property into the adjoining stream.

On Sunday, September 23, the whole force, excepting that portion still at New Market, began the march homeward, via Edinburg, New Market, Harrisonburg, Winchester, and Washington, D. C. All patients had been cleared from both hospital stations by rail to the naval hospital, Washington, D. C. One patient who had been severely burned during the New Market affair had to be cleared from the hospital station at New Market into a civil hospital at Harrisonburg, he was later brought forward by ambulance to the naval hospital at Washington, D. C. When the force arrived in Washington, October 5, all patients had been cleared from our rear. Civil hospitals were rarely used. Had the situation warranted it all of our cases could have been handled in the medical battalion. The only case not handled by the Medical Department from the onset, was that of a member of the force who had strayed from his unit in Harrisonburg where he was struck by a truck and taken by civilians to the local hospital. He was later evacuated. The march homeward was uneventful, all units of the Medical Department continuing to cover the force as shown above.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Upon arrival in Quantico, October 7, demobilization began at once as outlined in the following memorandum:

OFFICE OF THE FORCE SURGEON,
Marine Barracks, Quantico, Virginia, 8 October, 1923.

Memorandum No. 7:

Subject: Demobilization of Field Units of the Medical Department.

1. All temporary duty officers will be released as soon as their personal and organization equipment has been checked and turned in and a written report concerning their observation and comments relative to equipment of the Medical Department of the Expeditionary Force has been submitted.

2. Ten days' leave for all enlisted men of the department will be given during the month of October. The first group of about 50 per cent of the total strength will be granted leave on the 10th of October and the second group on the 20th of October. Unit commanders will submit lists of men desiring leave, at once, in the groups they desire. . . .

3. All medical officers will report men deserving special mention for excellence in conduct during the maneuvers.

4. All individual equipment will be checked and turned in, when cleared, as follows:

Quartermaster to Service Company, Med. Bn. Bldg. No. 409.
Medical Dep't to Service Company, Med. Bn. Bldg. No. 409.

All other quartermaster property will be checked at once and a report submitted to this office. Instructions regarding disposition will be issued later.

5. All Medical Department property, other than individual, will be checked and turned in to the Commanding Officer, Service Company, or to his assistant at the Red Cross building.

6. All official transportation of the Medical Battalion * * * except the ambulance company, will be turned over to the Commanding Officer, Service Company, as soon as unloaded. This transportation will be pooled until further orders. Requests for transportation will be made to Commanding Officer, Service Company, or his representative in charge of the pool.

7. All officers will keep contact with their headquarters at all times so that they may be reached by phone or messenger.

Headquarters Force Surgeon, Building No. 1.
Headquarters Medical Battalion, Building No. 409.
Headquarters all companies of Medical Battalion except Hospital Company, rear of Building No. 409.
Headquarters Hospital Company, Sick Quarters.
Headquarters 5th Regiment, Medical Detach. Dispensary No. 6.
Headquarters 10th Regiment, Medical Detach. Dispensary No. 3.

W. CHAMBERS.

Looking back at the maneuver, many details are seen which might have been changed, but considering the period as a whole and recalling the many difficulties encountered together with the fact that the majority of the personnel was totally inexperienced in field work, it is believed that the exercise gave a considerable number of individuals extremely useful field training which should be of value in the future.

The writer desires to here express his sincere admiration of the splendid effort made by the members of the Medical and Hospital Corps during the many trying periods of the march through Virginia.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

REFERENCES.

(1)

MARINE CORPS EXPEDITIONARY FORCE.
Quantico, Va., 24 August, 1923—9.00 A. M.

Field Orders No. 1.
Maps: U. S. G. S., 1:125000, Mt. Vernon sheet.

Troops (in order of march):

(*a*) (Combined tons.) (less animal-drawn sec. and detachments Medical Bn.).

(*b*) Fwd. Ech. Force HQ.
Sig. Co. (less dets.).
5th Regiment Marines.
Eng. Co. (less dets.) with Gas Co. attached.
Animal-drawn sec. of Combined Tn.

1. This Force (less 6th Marines and 10 Marine Arty.) will march via the QUANTICO–TRIANGLE–JOPLIN–HOLMES CORNER road to camp site on QUANTICO CREEK on 27 Aug., 23.

2. (*a*) The combined Tns. (less animal-drawn section and dets. Medical Bn.) will clear CR Post Garage at 7.00 A. M.

(*b*) Troops in order of march will follow Tns., head of column passing CR Post Garage at 7.15 A. M.

3. See Adm. O. No. 1.

4. (*a*) Plan of Sig. Com.
(*b*) CPs.

Force: Closes Quantico 9.00 A. M. 27 Aug., 23; opens same date and hour at QUANTICO CREEK camp site.

By Command of Brig. Gen. Butler.

H. N. MANNEY, Jr., *C. of S.*

Official.
W. N. HILL, *F–3.*
Distribution "D."

MARINE CORPS EXPEDITIONARY FORCE,
Quantico, Va., 24 August 23—3.00 P. M.

Administrative Orders No. 1.
To accompany Field Orders No. 1.
Maps: U. S. G. S. 1:125000, Mt. Vernon Sheet.

I. SUPPLY:

A. Railhead—
Quantico, Va.

B. Rations—

1. See Section V F–4 Annex.
2. Troops to be provided with cold lunch Aug. 27, before leaving Quantico, Va.
3. Distributing points Aug. 27—
(*a*) Quantico, Va.—
10th Regiment.
Air Service.
(*b*) Bivouac of Force Train (on main road near camp site)—
Headquarters Company, 1.55 P. M.
5th Regiment, 2.00 P. M.
All others, 2.30 P. M.
Ice, bread, and commissaries will be issued at this time.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

I. SUPPLY—Continued.
C. Water supply.
1. Water tanks to be filled before leaving Quantico, Va.
2. Distributing points, August 27, Quantico Creek on main road south of camp, at all hours.
3. All water to be filtered and chlorinated.

II. EVACUATION:
A. Men—
1. Collecting stations enroute. One every four miles.
2. Hospital station. Quantico, Va. One section of Hospital Company establish station at Brentsville camp site.

III. ROADS:
A. Unrestricted.
B. Maintenance—
Engineers will repair culverts and bridges to carry our heavy loads and put up telephone lines. Direction signs will be posted at all important road junctions.
C. Circulation, Unrestricted.

IV. MILITARY POLICE:
A. Traffic control—
1. Where main road is narrow arrange for truck train to keep middle of road.
2. Traffic Control Post will be established at all important road junctions.

V. TRAINS:
1. Bivouac in place designated by Quartering officer.
2. Order of march—
Signal Company.
Headquarters Company.
Military Police Company.
Engineers.
5th. Regiment.
Force Train.
Medical Battalion (less detachment).
3. Trains released when camp is reached.

VI. MISCELLANEOUS:
A. Quartering—
Quartering party leave Post Garage at 6.00 A. M. in one reconnaissance car furnished by Force Train.
B. Mail—
To be distributed from mail truck, on arrival in vicinity of Force headquarters.

By Command of Brig. Gen. Butler.

H. N. MANNEY, Jr., *C. of S.*

Official.

JETER R. HORTON, *F-4.*

Distribution "A."

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(2) MARINE CORPS EXPEDITIONARY FORCE
Quantico, Va., 24 August, 1923.—2:30 p. m.

Field Orders No. 2.

Maps: U. S. G. S. 1:125000, Mt. Vernon, Fredericksburg, Spotsylvania and Gordonsville sheets.

1. The force marches on STAUNTON via CULPEPER-ORANGE and GORDONSVILLE on 27 August 23 (see Field Orders No. 1).
2. The 10th Marine Arty (less 1 Bn.) will march on GORDONSVILLE on 1 September, 23, via FREDERICKSBURG–ORANGE. On Sept. 4, 23, it will join the main body at Orange, where it will halt clear of Orange–Gordonsville turnpike until main body has passed, when it will follow the main body to Gordonsville.
3. The A. S. Tn. is attached to the 10th Main Arty.
4. CPs:

Force: Closes Quantico 9.00 A. M. 27 August, 23; opens same date and hour at QUANTICO CREEK camp site. 10th Regiment will be reported to Force daily.

By Command of Brig. Gen. Butler.

H. N. MANNEY, *C. of S.*

Official.
W. N. HILL, *F–S.*
Distribution "A."

(3) MARINE CORPS EXPEDITIONARY FORCE,
Camp No. 1. Quantico Creek, Va., 27 Aug. 23—5.30 P. M.

Field Orders No. 3.

Maps: U. S. G. S., 1:125,000 Mt. Vernon and Warrenton Sheets.

Troops (in order of march):

(*a*) Fwd. Ech. Force Hq.
(*b*) M. P. Co. (less dets.)
Force Band.
5th Marines.
Eng. Co. (less dets.)
with Gas Co. attached.
(c) Combined Tn. (less dets. Med. Bn.)

1. This Force (less 6th Marines and 10th Marines Arty.) will march to camp on KETTLE RUN ON 28 Aug. 23, via the INDEPENDENT HILL–RJ, 2-½ miles NW. of INDEPENDENT HILL—north fork—BRENTSVILLE–NOKESVILLE road.
2. (*a*) Movement of Fwd. Ech. Force Hd., routine.
(*b*) The head of the leading element of the troop column will pass the initial point at 7.00 A. M.

(*x*) 1. Foot troops will march with 40 yards distance between Bns. and separate organizations, and 10 yards between companies. Cole carts will be drawn in single file.
2. Troops will halt and clear the road when the head of the column reaches RJ ¼ mile NW. of INDEPENDENT HILL and allow the trains to pass in compliance with paragraph 3.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(a) 1. Tns. in the following order will pass the foot troops when they halt in the vicinity of INDEPENDENT HILL. The head of the column will pass the initial point at 8.00 A. M.:

Sig. Co. (less dets.).
Force Hd. Co.
M. P. Co. (less dets.).
Med. Bn. (less dets.).
5th Regt.

2. The head of the animal drawn section of the combined Tn. will pass the initial point at 8.30 A. M., and will follow the foot troops into camp from INDEPENDENT HILL.

3. The head of the Force Tn. (less animal drawn section) will pass the initial point at 9.30 A. M.

(*b*) Distributing points for Aug. 28.

1. Rations.

Bivouac of Force Train on Camp site.
Force Hq. Co. 1.55 P. M.
5th Regt. 2.00 P. M.
All others 2.30 P. M.

2. Water.

Farm house NW. of camp.

(*c*) Quartering Party leaves Force Headquarters at 6.30 A. M. in two reconnaissance cars.

(*d*) A detachment of the Engineer Company will police old camp site.

(*e*) All other administrative details same as Administrative Orders No. 1.

4. Cps: Force: Closes Camp No. 1 at 10.30 A. M., 28 Aug. 23; opens camp No. 2 (KETTLE RUN) same date and hour.

By command of Brig. Gen. Butler.

H. N. MANNEY, Jr., *C. of S.*

Distribution "B."

NOTE.—Initial point is on road at north limit of Camp area.

MARINE CORPS EXPEDITIONARY FORCE.
CAMP COOLIDGE, FORT DEFIANCE, VIRGINIA.
11 September, 1923—11.55 A. M.

Field Orders No. 1–X.

Maps: U. S. G. S. 1:125000, Staunton and Harrisonburg sheets.

1. (*a*) Red regular forces which marched on 9 September toward HARRISONBURG reached HARRISONBURG to-day and dispersed in bands. These Reds have revolted and are hostile to our forces.

Red irregulars are threatening foreign owned oil wells.

(*b*) The 6th Marines is guarding our base at Quantico and our line of communications.

2. This Force will occupy the oil well area to protect foreign property.

3. (*a*) The 5th Marines, plus Det. Med. Bn. (3 amb. animal-drawn), will on 12 September, 1923, send one battalion to each of the following places:

(1) Vicinity of PIEDMONT in readiness to protect the eastern group of oil wells.

(2) Vicinity of BURKETOWN in readiness to protect the northern group

(3) Vicinity of LONG GLADE (SPRINGHILL) in readiness to protect the western group.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(*b*) AS will continue reconnaissance and patrolling. It will report position of our troops and any large body of the enemy.

(*c*) All other troops will remain in Camp Coolidge.

4. See Adm. O. No. 1–X.

5. (*a*) Plan of Signal Company.

(*b*) CPs: Force CAMP COOLIDGE.

5th Regiment same as Force.

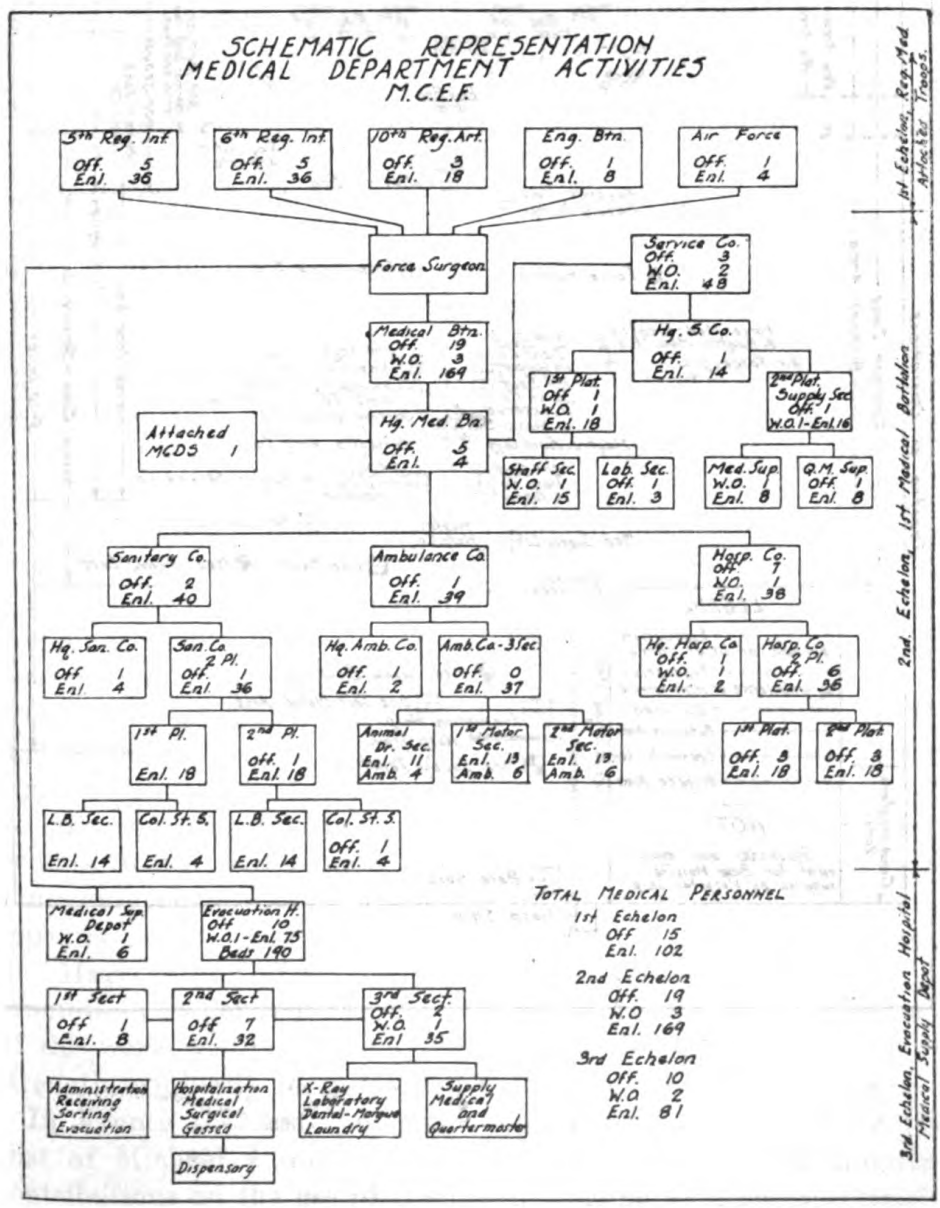
10th Regiment same as Force.

6th Regiment QUANTICO.

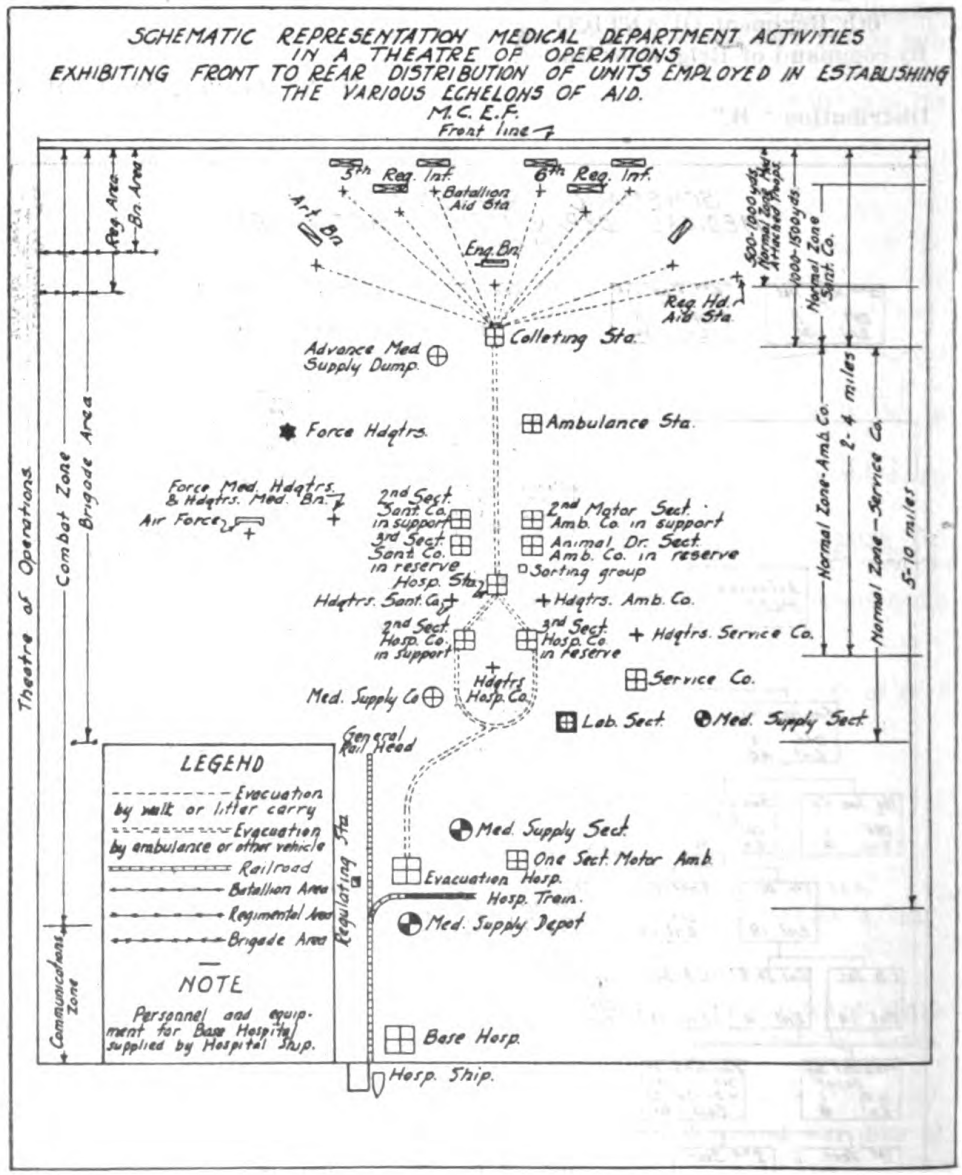
By command of Brig. Gen. Butler.

H. N. MANNEY, Jr., *C. of S.*

Distribution "B."



Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Digitized by Google
Original from UNIVERSITY OF MICHIGAN

PYELOGRAPHY.[1]

By WINFIELD S. PUGH, Commander, Medical Corps, United States Navy (Retired), Assistant Urologist, The New York Hospital and St. Marks Hospital, New York.

History.—Modern urology was undoubtedly born with the development of the cystoscope by Nitze and its improvement by his coworkers and students (1). The development of ureteral catheterization and rental functional tests have also been of great value, but of no less importance has been the discovery of the possibilities of pyelography and its rapid development.

Pyelography, like most other discoveries, is somewhat surrounded by confusion as to its early history. Many outline pictures had been taken of the ureters and kidney pelvis, prior to the advent of pyelography, by the use of wire stylets introduced within the ureteral catheter. One of the first attempts in this line was that by Prof. Geza Jllyes of the Royal Hungarian University at Budapest in 1902 (2).

Historians tell us that Klose, in 1904, was the first to directly inject the pelvis of the kidney and ureter for the purpose of taking a pyelogram in a case of double ureter (3). The original work of Voelker and Lichtenberg probably antedates this, although the complete report did not appear until 1906 (4). A review of this paper shows that the authors were endeavoring to outline the bladder evidently for the purpose of taking what we now call a cystogram. They introduced a 5 per cent solution of collargol into the bladder and by so doing it was found that some of the collargol worked its way up into the ureters and produced shadows on the plate. This led to further studies along this line and they were soon able to present a series of cases. This really represents the laying of the corner stone of pyelography.

One of the earliest to recognize the wide field opened up by pyelography was Braasch, and from 1910 on numerous contributions began to appear from him and his students (5). I believe he was the first to realize the shadow-producing effects of the halogen compounds, which still remain the basis of our modern work. After numerous contributions to the literature, his book on pyelography appeared in 1915 and is still a standard (6). In his department at the Mayo clinic, after considerable research, the use of sodium bromide in 25 per cent solution was adopted. Up to this time most of the work was being done with 10 per cent collargol, twice the strength originally recommended by Voelker and Lichtenberg.

In France the first important contribution seems to have been that of Michael Arana in 1915 (7). Among the most important contributions on the use of shadow-producing substances appearing

[1] From the James Buchanan Brady Urological Foundation of The New York Hospital.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

after those previously mentioned are that of E. L. Young, of Boston, on the use of mucilaginous solutions of argentide in 1915 (8) and the use of thorium by Burns in 1917 and 1918 (9).

In the year 1919 we were introduced to the use of the iodides of potassium and sodium, the former more particularly being advocated by Prof. Hans Rubritius, of Vienna (10) and the latter stressed by Cameron (11). A considerable amount of work was also carried on as to the relative value of X-ray tubes in connection with this subject. Some believed gas tubes gave the best picture, others pinned their faith to the Coolidge type of tube. The latter is so simple and readily adaptable for all purposes that it is now generally used.

Solutions.—Klose used bismuth, but it soon developed that there were fragments of the metal left behind which often produced irritation. No less important was the possibility of arsenical contamination of the bismuth. Collargol was said to readily cause damage to the kidney pelvis, but it must be remembered that this was used in the early days and the possibilities of faulty technique play no small part.

In view of the large amount of research which work in this line has stimulated, it is not surprising that a number of drugs have been introduced, but it is notable that we cling closely to the halogen group. It is quite essential that we use a solution which will readily drain off, and this necessity eliminates such substances as the bismuth solutions, argentide, argyol, etc.

Cameron recommends sodium iodide 25 per cent; Woodruff (12), bismuth and ammonium citrate 10 per cent. Josephs advises umbrenal, which is really an acid-free lithium iodide (13). Lowsley and Müller, after extensive experimentation, found that sodium iodide gave the best shadows, is nontoxic, and easily prepared. As a result of their researches this drug has gained considerable favor (14).

Preparations of fluid for injection.—Sterile ampoules of sodium iodide 20 per cent and a number of other preparations are now put out by the pharmaceutical houses, and is the best way to handle these chemicals.

Preparation of the patient.—In the urological clinics of this country we are most insistent on the proper preparation of the patient for Roentgen pictures of the urinary tract. In some of our institutions the patient is placed on a light diet, mostly liquid, for 24 hours previous to the picture. At other clinics the patient is told to eat lightly and is given an ounce of castor oil the night before and a rather thorough cleansing enema the morning the pyelogram is taken. Oleum ricini is undoubtedly the best medium for this purpose, as its action as a rule is prompt and it leaves no possible residue

Digitized by Google Original from UNIVERSITY OF MICHIGAN

that might cast a shadow. I have, however, often used salines where a quick action was necessary, and have had no difficulties.

In the European clinics, while it is the rule to use cathartics, notably oleum ricini, they by no means regard it as necessary as we do. I once heard such a well-known authority as Professor Josephs say that he had taken many pyelograms without the use of laxatives, as the well-filled kidney pelvis casts such a shadow that the significance of the picture can scarcely be disturbed by the intestinal contents. Only where a chronic constipation exists or a well-marked enteroptosis or nephroptosis is present, or where hard masses may darken the picture, does Josephs regard intestinal evacuation as really essential. Where necessary, that authority uses fairly energetic drugs, but as a rule the European believes good Roentgen and urological technique is attainable without them.

Pyelography table.—For the proper taking of kidney pictures it is necessary that we have a proper table. Most of those in use in our hospitals are not well adapted for this class of work, as they can not be quickly adjusted to the different postures called for in the various urographic techniques.

One of the most simple and readily adaptable is that devised by Lowsley, the essential features of which are as follows: frame of steel tubing not too heavy, legs spread to make it firmer and stronger. The legs at foot of table have rubber feet, those at the top rubber-tired wheels, which render it easily movable and yet firm when placed. The Monel metal top is noncorrosive and is long enough for a very tall man to rest his head upon it, while a spout at the foot allows fluids to escape into a reservoir. A control wheel at the front is handy to the operator to change the elevation of the pelvis. Bierhoff knee rests of an improved type are attached and can not rotate, but may be adjusted to any position desired by means of a spring catch. No X-ray tube or holder is attached, and in my experience I find this is more to be desired. The plates are laid upon the top of the table under the patients body, this retains them where they are most desired, and the flat top of the table prevents them from being cracked. This table, while primarily a cystoscopic adjunct, is quickly adapted to the closely related urographic techniques. The X-ray tube mounted on a movable standard can be quickly shifted from one cystoscopic booth to another by its overhead electrical connections, instead of having several patients waiting for one table where the tube is attached. This is an important factor in a busy clinic.

Technique of Pyelography.—From recent observations made in all of the large urological clinics of America and many of those of Europe, it appears as if investigators were about equally divided

Digitized by Google Original from UNIVERSITY OF MICHIGAN

as to the employment of the gravity or the injection method. I note still more recently that several clinics are being converted to the injection method. In regard to the size of the kidney pelvis one sees all kinds of quotations and figures. Last summer I heard a prominent European urologist say that the kidney pelvis was smaller than most of us thought and that a capacity over 5 or 6 cubic centimeters was unusual. Most observers give us a little more room often up to 10 cubic centimeters. In cases of doubt it is a very easy matter to find out, by the simple injection of boric acid solution. Incidentally it is always best to use boric acid solutions in the bladder and kidney pelvis as it reduces the possibility of the contaminations that may occur in sterile water.

If one elects the gravity technique, the solution should be placed in a small burette-like glass, the tubing from which is connected with the ureter catheter, and the tube then held only slightly higher than the patient's body. This is a very slow method but a very safe one.

With the injection method a 10 cubic centimeter Luer syringe is usually used, the fluid being drawn up from the ampoule and then injected very slowly until the barrel is empty or signs of annoyance appear. The injection should be stopped at once on the appearance of any sign of discomfort, as this is often the warning signal that the limits of safety have been reached. The catheter is usually passed as far as the upper calyx, but necessity may modify this somewhat.

In connection with technique there are several important points aside from the direct injection that one should give careful consideration:

First. Pyelography is distinctly a hospital procedure and should be performed there.

Second. The patient should lie on his back with the head low, and any fear or anxiety carefully allayed.

Third. Everything should be in readiness and in position before the injection is started; that is, tubes, plates, etc.

Fourth. The catheter used should not be large enough to fill the entire lumen of the ureter, a No. 5 F will usually suffice. This allows any excess fluid to drain off from the renal pelvis, back into the bladder.

Fifth. Graduated catheters are best, as they give one an idea of the location of difficulties should they be encountered.

Sixth. Drain off as much fluid as possible from the pelvis before injecting.

Seventh. Remove as much as possible of the shadow-producing substance from the pelvis, after the picture is taken.

Eighth. Last, but not least, I believe it advisable never to do both sides at once: that is, avoid the so-called double pyelogram. I be-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

lieve this can not be too strongly emphasized. More of this later. I have purposely avoided any description of X-ray technique in this article as it is in itself a very big subject and would carry us too far afield.

Reactions.—Reactions occur at times, but as a rule are not severe. Slight painful sensations over the renal area may persist for several hours; and at times renal colic occurs. Nausea and vomiting or chills are not unusual and cases of pyelonephritis have been reported. Aside from an occasional temperature rise of a few degrees lasting for a short period, I have seen no real reactions in the large hospitals with which I have been connected.

Dangers of pyelography.—Are there dangers in the performance of pyelography? Yes, there are; both fanciful and real. It is unfortunate that our early progress in pyelography, as well as cystoscopy, was greatly hindered by the statements of prominent surgeons, that there were great dangers in the method and that patients were often made worse by it. These extreme views were held for long periods and in some quarters are really still present (16). Aside from this undue skepticism, the possibilities of trouble are often present.

Rupture of the renal pelvis has occurred. Necrosis of the kidney has followed injection of the pelvis under high pressure. I have seen two cases of suppression of urine, one for about 20 hours and another for about 36 hours, following double pyelograms. Morten has also reported some cases of this kind (17). I once saw a death follow a double pyelography in which the autopsy showed an aneurysm of the renal artery.

Some clinics have reported large series of cases, notably the Mayo clinic of almost 1,000 cases, without a serious mishap, but some others have not been quite so fortunate. How shall we guard against these mishaps? I believe that most if not all difficulties can usually be avoided by a careful adherence to the precautionary suggestions noted under the head of technique.

Pyelographic readings.—In a study of our pyelograms, the following points stand out as essential to our consideration:

First. We must study the size and shape of the pelvis, the normal being called somewhat trumpet shaped.

Second. Does the opaque catheter pass into the upper calyx vertically, or is there a curve and how marked is it?

Third. What is the appearance of the uretero-calicine line? (The upper ureter, the lower margin of the renal pelvis, and the lower calyx are said to form a symmetrical curve amounting to half a circle; this constitutes the so-called uretero-calicine line.)

Fourth. The calyces must be studied in detail, as their size, shape, and arrangement differ greatly in the various pathological conditions.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Fifth. The expansion of the upper end of the ureter. This is usually gradual and there is nothing to mark the junction with the renal pelvis.

The principal diseases of the kidney in which pyelography is of most value are hydronephrosis, pyonephrosis, tumors, tuberculosis, polycystic kidney, and the lesions due to calculi. We shall endeavor to run over these conditions, somewhat briefly.

Hydronephrosis.—Hydronephrosis is usually or in fact I might say always due to some partial obstruction of the kidney drainage, either continuous or intermittent. The blockage may be anywhere from the anterior urinary meatus, up to the pelvis of the kidney. I remember well a very marked case of pus kidney that undoubtedly had as the real etiological factor a moderate anterior urethral stenosis. It is often really surprising to note what a marked hydronephrotic condition may follow a most trivial appearing, and at times intermittent, urinary interference. The lesions of hydronephrosis and pyonephrosis we shall consider together. From a pyelographic standpoint we are interested in the mechanical changes that take place in the pelvis of the kidney due to pressure and which account for the marked variations noted in our films. Briefly they are somewhat as follows: Incident to the gradually increasing pressure of the stagnant urine, we notice that the general pelvis has a taut appearance and is dilated. The pressure forces the renal calyx into a battle against it, and as this continues there is a final paralysis of the musculature usually on one side of the circumference of the calyx entrance. This allows the stagnant urine to penetrate into the urinary tubules of the papillae and the calyx niches. The cupping of the calyces then disappears, the neck becomes shortened or broadened and in advanced cases they are simply rounded out areas, projecting from the greatly expanded pelvis. The pelvis often becomes more rounded or even square. The upper border is elevated, the lower depressed, pressure finally wiping out most of the landmarks entirely. The line of the ureter and upper calyx are considerably changed. The catheter no longer enters a calyx, but raises up the roof of the pelvis.

Tumors of the kidney.—The essential features of a tumor as demonstrated by a pyelogram are first renal displacement. Why do we not say mass? Because a mass is usually palpable, and if we can feel a definite tumor mass, those of experience do not recommend a pyelogram, as there is too great a possibility of scattering the tumor cells. The hypernephroma of Grawitz, or as Wilson calls it mesothelioma, is one of the more frequent forms of kidney tumors, and is highly malignant. The cells of this form of new growth are readily detached and sent on their way into the general circulation through the renal vein. Incidentally Eisendrath has recently recommended

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN



Fig. 1.—Early hydronephrosis following a stricture of the upper ureter, a type that responds well to treatment.

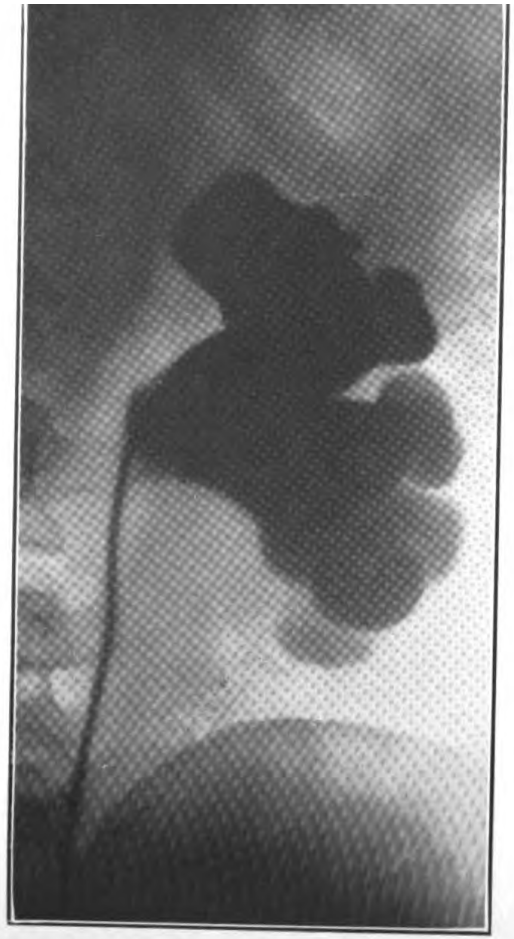


Fig. 2.—Hydronephrosis with well-marked dilatation of pelvis and calices, without, as yet, complete obliteration of the landmarks.



Fig. 3.—Tuberculosis of kidney and ureter, showing typical moth-eaten appearance.



Fig. 4.—Polycystic kidney. Note the extent of the mass. A similar condition existed on the opposite side. Symptoms were not marked, yet patient died.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the preliminary ligation of the kidney vein before handling the rest of the renal pedicle in this type of neoplasm (18).

Second. Filling defects due to encroachment.

Third. Abnormal position of the renal pelvis.

Fourth. Deformities of the uretero-pelvic juncture.

There are other characteristics but it is on these four alone that we make most of our diagnoses.

It is true that renal displacement does not take place in all cases, but I am convinced of its great value by the observation of many pictures. The displacement is usually downward or outward, often a combination of these two directions. Filling defects are almost always present and are due to the tumor mass causing pressure on the calyces, this pressure at times also lengthens them. The renal pelvis may be raised, lowered, or pressed well to one side, usually outward. Its direction is markedly altered and its axis far from normal.

The uretero-pelvic juncture is changed, often considerably; that is, there is a decided curving at this point, or an angulation. At times this is so marked that we can almost call it a kink. In renal tumors it is always advisable to take pictures of the lungs and long bones, in order to determine if metastasis is present.

Tuberculosis.—For obvious reasons a pyelogram should not be made in a case of renal tuberculosis if it can be avoided. It is usually possible to make a diagnosis of kidney tuberculosis by the finding of the tubercle bacilli in the kidney urine at least. Often the bacilli may be found by the antiformin concentration tests, or guinea pig inoculation. In a closed renal tuberculosis it may be necessary to do a pyelogram and in this disease, when it is done, we get a quite typical picture. Typical pictures are marked in well advanced cases; and it is seldom we encounter early renal tuberculosis.

What are the usual pyelographic points of interest in this condition? Undoubtedly the most striking is the areas of necrosis, often extending from the pelvis well up into the cortex of the kidney. This often gives a ragged or moth eaten appearance and is noticeable fairly early. A dilated pelvis is usually present along with tuberculous disease of the ureter and resultant stenosis. A rather important point to remember is that tuberculosis of the kidney seems too often to be a silent process until the disease is fairly well advanced. The early symptoms as a rule being not severe enough to cause real annoyance. This is particularly so when the original areas are in the parenchyma of the organ.

Polycystic kidney.—This condition in the vast majority of cases can be diagnosed without a pyelogram. The large kidney sack, usually bilateral, can be distinctly palpated as a rule. In the pyelogram they usually appear like large multilocular cysts, with some-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

what of a kidney shape, often extending from the pelvis, well up beneath the costal borders.

Renal calculi.—Pyelography makes possible the diagnosis of kidney stone in about 97 per cent of our cases. The remaining 3 per cent are of the xanthin and cystin types which are so fine that they as a rule give us very little clue, except when we find their fragments in the urine. All of the other forms of concretions cast a very definite shadow. Hunt tells us in a report based on the examination of 1,800 cases that only 8 per cent of the stones are in the parenchyma of the kidney (19). This is an important contribution, but even so it is still quite essential for us to know whether the stone is in the parenchyma or the pelvis, as the operative procedure is somewhat different in the two locations.

Differences in individual development may play a part in causing difficulties in diagnosis, but it will usually be found that a stone whose shadow appears to be decidedly mesial lies in the true kidney pelvis and can be removed by pyelotomy. If, however, the shadow lies within the kidney proper, a nephrotomy may be necessary for its removal. The intensity of the shadow is dependent on the chemical composition of the stone, the best shadows being cast by the calcium salts, carbonates, oxalates, and phosphates in the order mentioned. Triple phosphates and uric acid are less intense and xanthin and cystin cast good shadows very seldom.

From the foregoing brief review of the Roentgen technique aided by shadow-producing substances introduced into the kidney pelvis, I believe it becomes clear that pyelography, as it is now generally called, has passed the trial period. This procedure when properly carried out is practically free of ordinary dangers, is of the utmost value in urological diagnosis, and should be used wherever indicated.

Note.—The Pyelograms are taken from cases examined in our service at the New York Hospital, and reproduced here by kind permission of Dr. Oswald S. Lowsley, director of the Brady Foundation for Urology at that institution.

REFERENCES.

1. Wossidlo, E. Kystoscopischer Atlas. Leipzig, 1921.
2. Jllyes, G. San Rokus Urological Reports. Budapest, 1903.
3. Kretschmar, H. Surgical Clinics of North America, August, 1923.
4. Voelker and Lichtenberg. Muenchener Med. Wochenschrift LIII, 105, 1906.
5. Braasch, W. F. Annals of Surgery, Nov. 1910.
6. Braasch, W. F. Pyelography. W. B. Saunders, Phila., Pa., 1915.
7. Arana, Michael. Nouvelle Methode de Diagnostics des affections Renales. Gittler. Paris, 1913.
8. Young, E. L. Boston Medical and Surgical Journal, 1915, CLXXII, 539.
9. Burns, J. E. Journal American Medical Association LXVIII, Feb. 1917. Johns Hopkins University Medical Bulletin. June, 1916.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

10. Rubritius, Hans. Von Frisch Festschrift. Vienna, 1919.
11. Cameron, D. F. Journal American Medical Association, June 14, 1919.
12. Woodruff, G. Post Graduate Hospital Reports, New York, 1921.
13. Josephs, Eugen. Kystoscopischer Technik, Berlin, 1923.
14. Lowsley and Müller. Journal of Urology, Jan., 1923.
15. Keyes and Mohan. American Journal of Medical Sciences, 1915, CXLIX, 30.
16. Morten, H. H. Journal of Urology. Sept., 1923.
17. Eisendrath, W. Surgical clinics of North America. August, 1923.
18. Hunt, V. C. Lancet, Jan. 1, 1923.

HYDRONEPHROSIS.

By R. B. Engle, Lieutenant (J. G.), Medical Corps, United States Navy.

Hydronephrosis is a chronic distension of the pelvic cavity of the kidney by an aseptic liquid derived from normal urine, with progressive sclerosis of the walls of the sac.

Clinically, hydronephrosis is not a common disease. Many more cases are discovered at autopsy than present evident clinical signs and symptoms during life. Statistics show that the disease is twice as frequent in females as in males. When it occurs it usually affects the right kidney, and presents symptoms generally in the third decade of life.

The causes of hydronephrosis have been variously classified. Obstruction of the lower urinary tract, congenital and acquired, do not deserve to be classified as true hydronephrosis, as general dilatation of the entire uninary tract has proceeded and dilatation of the pelvis of the kidney is only the last stage. The true cause is an incomplete obstruction of the ureter. If the obstruction is in the lower urinary tract, the hydronephrosis is of course bilateral, and rarely aseptic, the case is also usually an old neglected affair.

The congenital type is very interesting, and it is often very difficult to prove a congenital basis for the existing pathology. The ureter in intrauterine life is constricted in some places and dilated in others. Constrictions are found most frequently at the utero-pelvic junction and at the utero-vesical orifice. Compression by an anomalous branch of the renal artery given off prematurely and passing back of the ureter at the uretero-pelvic junction, and compression by a band representing the remains of the duct of Mueller or the Wolffian duct, may also cause constrictions. Valvules may also be formed by the mucosa and muscular layers of the ureter, which normally disappear under the influence of growth and urinary pressure. Remnants of these valvules persisting, however, may develop an actual hydronephrosis with an appreciable tumor, thus partially explaining why hydronephrosis appears in the third decade of life. Congenital ureteral strictures are sometimes found,

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

also torsion of the ureters, which is, however, not common. With exstrophy of the bladder and abnormalities of the kidney, such as a single kidney and horse-shoe kidney, hydronephrosis is a common sequel.

Acquired hydronephrosis is usually the result of much more obvious conditions, such as:

(A) Obstructive lesions of the walls of the ureter, including ureteritis, usually tuberculous, and acquired strictures which are very rare.

(B) Faulty position of the upper part of the ureter produced by movable kidneys or scoliosis.

(C) Obstruction by foreign bodies, as stones, tumors, and blood clots.

(D) External compressions caused by cancer of uterus and prostate, uterine fibroids, pregnancy, and vesical tumors, and tuberculous glands.

These causes of hydronephrosis, as stated above, may further be classified as extrinsic and intrinsic, a method probably more convenient from an academic standpoint.

I. *Intrinsic causes:*

(A) Those affecting the kidney pelvis, such as tumors, calculi, and blood clots.

(B) Those affecting the ureters, such as calculi, blood clots, tumors, ureteritis, strictures, and structural defects (valves and angulations).

(C) Those affecting the bladder, such as calculi, tumors, and prostatic enlargements (benign and malignant).

(D) Those affecting the urethra; namely, urethritis and stricture.

II. *Extrinsic causes:*

(A) Ptosis of kidney.

(B) Anomalous arteries to kidney crossing ureter.

(C) Pressure of abdominal neoplasm, tumors of bladder, uterus, rectum, and prostate.

(D) Ovarian cysts, tuberculous glands, retroflexion of uterus, etc.

Recent investigations at the Brady Urological Institute of Johns Hopkins Hospital have brought to light an interesting additional cause of hydronephrosis, a valvelike condition of the urethral mucosa, of congenital origin, in the region of the vera montanum, demonstrable only by retrograde catheterization and by autopsy.

The pathological changes presented by hydronephrosis vary directly with the amount of obstruction, the time since inception, and the incidence of infection. The train of events is easily deduced.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Urine accumulates in the kidney pelvis and calyces; the parenchyma is compressed with reduction of its nutrition and secreting capacity, producing anemia and atrophy in first the medulla and then the cortex of the kidney. In long-standing cases the kidney becomes a large fibrous cyst, with a series of pouches representing the original calyces, the walls of these pouches being thin and translucent or thick and fibrous. The kidney cortex may be reduced to practically nothing. Adhesions between the sac and the surrounding structures are common. The content of the sac is urine or, in infected cases, pus, giving a hydropyonephrosis. The opposite kidney may present a moderate nephrosis.

With obstruction of the lower urinary tract, the ureters are also affected, showing varying grades of dilatation and tortuosity. The bladder presents the signs of retention, dilatation, trabeculation, cellule formation and diverticuli.

The symptoms of hydronephrosis vary exceedingly. Many cases remain latent, and in many more cases the subjective symptoms are few. Pain is not ordinarily a prominent symptom except in the intermittent type, in which periods of renal colic, a large tumor in the loin and oliguria alternate with periods of freedom from pain, small tumor, and comparative polyuria. The objective symptoms are: a bulging in the ileo-costal region which on palpation shows a rounded, elastic mass; hematuria is sometimes marked; chemical analysis of the urine from the hydronephrotic kidney shows diminution of urea and chlorides; oliguria and intermittent anuria are common, and during anuria, nausea, vomiting, and pain as in renal crises occur.

The course of hydronephrosis is, in the great majority of cases chronic, covering a period of years. A sudden obstruction does not cause hydronephrosis. Infection is frequent, leading to hydro-pyonephrosis and pyonephrosis. In bilateral cases uremia may supervene. Acute exacerbations are the rule.

The diagnosis may be made by the observance of the symptoms, history, and physical findings, checked particularly in early cases by chemical analysis of urine from each kidney, cystoscopy, ureteral catheterization and pyelography. Measurement of urine output is often helpful, as a sudden large flow of urine followed by a disappearance of the pain and tumor is diagnostic. Pyelography is a very efficient and accurate method of demonstrating distention of the kidney pelvis and ureters. A 25 per cent solution of sodium bromide is injected through a ureteral catheter into the pelvis until the pain felt by the patient shows a quantity has been introduced sufficient to entirely fill the pelvis. Though estimates vary considerably, it is generally believed that a normal pelvis should hold 10 cubic centi-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

meters of fluid, and a pelvis holding over 15 to 18 cubic centimeters is distended, this distention being an early hydronephrosis.

The prognosis depends on (a) the cause of the obstruction, (b) compensating hypertrophy, (c) unilaterality, (d) infection, (e) the possibility of surgical relief. A return to normal is impossible, though spontaneous atrophy with obliteration of the sac has been known to occur.

Doctors Frank Hinman and O. W. Butler, of San Francisco and Los Angeles, respectively, have recently been conducting a series of experiments on dogs with reference to kidney repair, and particularly to early and late changes after relief of brief artificial obstructions to the ureters. They summarize their work in the following statement: "A hydronephrosis of seven days' duration from total ureteral obstruction returns anatomically and functionally to about normal. The recovery is more prompt if the opposite kidney is removed or so diseased that it is incapable of complete function. The recovery of a hydronephrosis of from 14 to 28 days' duration requires the stimulus of compulsory function, which in the longer period must be gradually and not suddenly applied. If left in partnership with the normal kidney, which meanwhile has undergone compensatory hypertrophy, atrophy will replace the initial repair, an atrophy of the nature of a disuse atrophy, even in the case of hydronephrosis of shorter duration." Their conclusions are that, "there is considerable initial recovery of function and repair hypertrophy of a kidney after relief up to 28 days of total obstruction. This recovery even after shorter periods of obstruction (14 days) is temporary if the healthy kidney is undisturbed, and in the course of several months an atrophy of the nature of a disuse atrophy replaces it." Experimentally their work tends to prove that if the kidney has been damaged to the extent that the phenolsulphonephthalien output is very low it is useless to put that kidney back into competition with the opposite kidney if compensatory hypertrophy has taken place. They believe it is better to do a nephrectomy rather than to attempt repair, provided the other kidney is healthy and fully compensating.

The treatment of hydronephrosis is both palliative and radical. Acute attacks of pain and retention occurring in the course of the disease are treated by rest in bed, morphine or other sedatives, and ureteral catheterization. Radical treatment depends on (a) the cause of the obstruction, (b) its site, (c) the condition of the affected kidney, (d) the condition of the opposite kidney. The guiding principles in the choice of methods of treatment are, first, to preserve as much as possible of the affected kidney and give the remaining

Digitized by Google Original from UNIVERSITY OF MICHIGAN

parenchyma every chance to perform its function; second, to remove the cause of the obstruction if possible, and, third, not to remove the diseased kidney unless its remnant is utterly useless (as proven by chemical analysis of the urine (and a phenolsulphonephthalien kidney function test of that kidney), and unless the opposite kidney is positively known to be healthy.

The first criterion may be carried out by various repair operations on the kidney and its pelvis, such as nephrotomy, and ureteropylo-anastomosis and pyloplication. In a unilateral hydronephrosis ureteral catheterization is sometimes practiced. In bilateral hydronephrosis causing severe pressure symptoms and anuria aspiration of the tumor may be done as a palliative measure. In fully one-third of all cases, according to Keene, nephrotomy with drainage cures the condition without a fistula remaining, even if the obstruction is not found. An incision is made into the dilated pelvis through a lumbar incision, the interior of the sac inspected, and the ureter catheterized from above if possible. A fistula is then established, and after waiting for two or three months until the sac has diminished in size, a further operation for the obstruction may be undertaken.

The cause of the obstruction may be relieved by ureterotomy for stones, ureteroplasty for stricture, and for obstruction of the ureter at or near its pelvic insertion one of the following methods may be employed, (1) division of any mucosal valves between ureteral lumen and the dilated pelvis, (2) resection of ureter with direct implantation of the upper end into the lowermost part of the dilated pelvis, (3) a ureteropylo-anastomosis, or (4) a pyloplication, in which the walls of the pelvis are infolded by Lembert suturing. Kinking of the ureter caused by kidney ptosis may be reduced by nephropexy aided by massage and retentive bandages. The operation of nephrectomy is ordinarily considered to be the last resort, but if the opposite kidney has a normal function, nephrectomy should be favorably considered, as saving remnants of pathological kidney parenchyma is not of great importance, but is rather a thing to be avoided.

Hydronephrosis is rendered a serious disease by its sequelae. Infection may easily supervene, particularly in bilateral cases. Anuria and uremia may occur. Therefore, to properly treat this condition an early diagnosis and, if necessary, early surgical interference is to be emphasized. Many advanced cases are the result of neglect and ignorance, which might well be avoided by a proper knowledge and consideration of the symptoms and diagnostic measures presented in this brief treatise.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TREATMENT OF BICHLORIDE OF MERCURY POISONING WITH CALCIUM SULPHIDE AS A CHEMICAL ANTIDOTE, A PRELIMINARY REPORT.

By J. M. McCANTS, Lieutenant, Medical Corps, United States Navy.

Since the publication in 1917 of an article in the Journal of Laboratory and Clinical Medicine entitled "Calcium sulphide as the chemical and clinical antidote for mercuric chloride poisoning with experiments and case reports" by Dr. J. H. Wilms, of Cincinnati, this form of treatment has apparently come to the front as an important therapeutic measure. This article, together with correspondence from its author, formed the basis for a very excellent paper by Chief Pharmacist E. G. Swann, United States Navy, entitled "Treatment of bichloride of mercury poisoning with calcium sulphide," which appeared in the January, 1923, number of the Hospital Corps Supplement to the United States Naval Medical Bulletin.

A brief summary of the salient points in Mr. Swann's article in regard to the claims held for calcium sulphide would seem appropriate here, and is given as follows:

1. Calcium sulphide is a chemical antidote for mercuric chloride, forming an insoluble and, therefore, nonpoisonous precipitate of mercuric sulphide, the chemical equation being $HgCl_2+CaS=HgS+CaCl_2$.

2. When administered, a grain of calcium sulphide is given for each grain of bichloride taken, one grain of CaS being sufficient to combine with four grains of $HgCl_2$.

3. The method of administration *par excellence* is intravenously, one grain of calcium sulphide to the ounce of water, the solution having been boiled and filtered through cotton. In case U. S. P. calcium sulphide is used, it must be remembered that that drug is only 55 per cent pure, and the solution should be made up accordingly. Calcium sulphide may also be given by mouth in doses of 2 to 5 grains every two hours until an excessive amount is taken. It is important that all solutions be used fresh, since a stale solution may cause death by the action of calcium on the spinal cord.

4. Cases so treated (by mouth or intravenously) usually show an uneventful recovery.

5. The use of calcium sulphide in the treatment of bichloride of mercury poisoning has been entirely satisfactory.

6. There are no objections to its use.

7. It is extensively used and the last word on the subject to date, displacing all other so-called antidotes; it is simple, sure, safe, quick.

8. The method of administration as originally advocated by Doctor Wilms has not been changed.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

9. Claims that calcium sulphide is poisonous or dangerous have been made by Haskel, Courtney, Sappington, Happ, and Fantas; but Doctor Wilms holds that these observers used faulty technique or misread the results of their experiments.

10. Doctor Wilms has had no deaths from the intravenous injection of calcium sulphide traceable directly to the solution (in either animal or human cases)—and he has treated many cases.

11. The U. S. P. calcium sulphide is good enough—the insoluble sulphate filters out—of course the purer the preparation of calcium sulphide the better the solution.

12. For many years egg albumen has been used as the antidote for bichloride of mercury; the white of one egg to every 4 grains of the poison. The objections to albumen are: (1) That an excess of the antidote will redissolve the albuminate of mercury which is first precipitated; (2) it is not always possible to determine the exact amount of poison that has been swallowed; (3) the amount of albumen obtainable from eggs varies according to the size of the egg and care exercised in separating it from the yolk; (4) bichloride of mercury is quickly absorbed from the stomach, passing into the circulation where the albumen has no effect. In their efforts to find an antidote that would neutralize the poison after it had been absorbed into the circulation, investigators tried the following substances, but on a whole the results were unsatisfactory: Sodium hypophosphite with hydrogen dioxide; sodium phosphite with sodium acetate; stannous chloride; solution of quinine and potassium iodide.

13. The intravenous use of calcium sulphide by hospital corpsmen is not considered advisable, but it may be given by mouth or the egg albumen treatment may be used.

We became interested in this form of treatment and determined to use it on the next case which presented itself.

Report of a case: V. U., ship's cook, was admitted to the naval hospital at Honolulu September 5, 1923, complaining of severe burning sensations in mouth and throat and of severe abdominal pain. Patient stated that he had taken five small, blue antiseptic tablets for suicidal purpose about five hours prior to his admission to the hospital, but had vomited some of the tablets almost immediately. Patient presented the following symptoms and signs on admission: Burning sensation in mouth and throat, severe abdominal pain, bloody vomiting, exhaustion, cough, with pains in chest, abundant seropurulent sputum, temperature 100, some diarrhea, some erosion of mucous membrane of mouth, congested pharynx, mucous râles, and general abdominal tenderness. A urinalysis five hours after the poison was taken showed the following: Slightly cloudy, almost

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

colorless urine with an acid reaction and sp. gr. 1.007. Trace albumin. Good many hyaline and finely granular casts.

Treatment: About one hour after the poison was taken, patient received a gastric lavage and a dose of castor oil at the emergency hospital, Honolulu, where sulphuric acid was considered the cause of the poisoning. At the naval hospital the case was considered mercuric chloride poisoning and treatment as follows was instituted: Absolute rest in bed, catharsis, egg albumen, sodium, bicarbonate, and calcium sulphide 10 grains intravenously. (The bichloride tablets were considered as containing about 2 grains each, and since some of these were vomited, it is probable that the patient received a great excess of calcium sulphide over that actually required.) The calcium sulphide was given about five hours after the poison was taken. It was also attempted to give calcium sulphide by mouth, but it has a disagreeable taste and odor (rotten eggs), and the patient was unable to retain it for this reason. The next morning the urine had all the characteristics of an acute nephritis with the exception that the amount was not materially diminished. From then on there was a rapid improvement, only a slight trace of albumin on the 11th, and none on the 16th of September.

The uneventful recovery of the case just cited aroused considerable local interest in the calcium sulphide treatment. It was, therefore, determined to try this form of treatment on rabbits. The following experiments were carried out.

Experiment 1.—Rabbits.

[To determine the minimum lethal dose of $HgCl_2$ when given intravenously.]

Animal No.	$HgCl_2$ dose.	Method.	Time.	Died.	Time.	Animal weight.	Remarks.
	Mgs.					*Gms.*	
1	1	Intravenously.....	2 p. m. 9-10-23.	No....		1,476	Slight diarrhea and indisposition.
2	2	do.....	...do....	No....		1,376	Do.
3	3	do.....	...do....	Yes...	12 p. m. 9-18-23.	1,347	Diarrhea and drowsiness.
4	4	do.....	...do....	Yes...	4 p. m. 9-12-23.	1,347	Marked diarrhea and drowsiness.
5	5	do.....	...do....	Yes...	11 a. m. 9-12-23.	1,257	Do.

The above experiment determined roughly the minimum lethal dose of bichloride of mercury U. S. P., powdered form, for rabbits of approximately the same age and weight. Three mg. was, therefore, considered the minimum lethal dose, or 0.0022 mg. per gram of body weight.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Experiment 2.—Rabbits.

[To determine the minimum lethal dose of $HgCl_2$ when given by mouth (stomach tube).]

Animal No.	$HgCl_2$ dose.	Method.	Time.	Died.	Time.	Animal weight.	Remarks.
	Mgs.					*Gms.*	
1	15	By mouth.....	2.30 p. m 9-26-23..	No....		1,094	Slight diarrhea and indisposition.
2	30	do.....	...do.....	No....		1,240	Do.
3	45	do.....	2.30 p. m.	Yes...	10-1-23..	1,450	Diarrhea and drowsiness.
4	60	do.....	2.30 p. m. 9-26-23..	Yes...	9-29-23..	1,745	Marked diarrhea and drowsiness.
5	100	do.....	...do.....	Yes...	9-28-23..	1,965	Do.

Experiment No. 2 determines roughly the minimum lethal dose of $HgCl_2$ on rabbits when administered by mouth. Forty-five mg. is considered the minimum lethal dose by mouth for a rabbit weighing 1,450 gms., or approximately 0.031 mg. per gram of body weight. It will be noticed that this is a much larger dose than the minimum lethal dose determined in experiment No. 1 with intravenous administration.

Having determined roughly the minimum lethal dose by intravenous and by oral administration it was decided to give rabbits at least twice the fatal dose of $HgCl_2$, or a surely fatal dose, before giving treatment with CaS. The following experiments were then carried out, using as an antidote U. S. P. (55 per cent pure) calcium sulphide (2 mg. per c. c. or approximately 1 grain to the ounce of distilled water), the solution being made up according to the direction given in Mr. Swann's article.

Experiment No. 3.—Rabbits.

[$HgCl_2$ intravenously: CaS intravenously.]

No.	$HgCl_2$ dose.	Method.	Time.	CaS dose.	Method.	Time.	Died.	Time.	Animal weight.	Remarks.
	Mgs.			*Mgs.*					*Gms.*	
1	10	Intravenously.	10 a. m. 9-29-23.	10	Intravenously.	11 a. m. 9-29-23.	Yes...	4 p. m. 10-1.	1,458	Diarrhea and drowsiness.
2	10	...do.....	...do....	10	...do.....	12 a. m. 9-29.	Yes...	12 a. m. 10-1.	1,579	Do.
3	10	...do.....	...do....	10	...do.....	1 p. m. 9-29.	Yes...	11 a. m. 10-1.	1,822	Do.
4	10	...do.....	...do....	10	...do.....	2 p. m. 9-29.	Yes...	3 p. m. 10-2.	1,944	Do.
5	10	...do.....	...do....	10	...do.....	3 p. m. 9-29.	Yes...	12 a. m. 10-1.	1,944	Do.
6	10	...do.....	...do....	10	...do.....	4 p. m. 9-29.	Yes...	3 p. m. 10-3.	2,187	Do.
7	10	...do.....	...do....	10	...do.....	5 p. m. 9-29.	No....		2,190	Do.
8	10	...do.....	...do....	10	...do.....	6 p. m. 9-29.	Yes...	12 p. m. 9-30.	2,430	Do.
9	10	...do.....	...do....	10	...do.....	7 p. m. 9-29.	Yes...	3 p. m. 10-1.	2,551	Do.
10	10	...do.....	...do....	10	...do.....	9 a. m. 9-30.	Yes...	9 p. m. 10-4.	1,458	Do.
11	10	...do.....	...do....	10	...do.....	12 a. m. 9-30.	Yes...	9 a. m. 10-1.	1,579	Do.
12	10	...do.....	...do....	10	...do.....	3 p. m. 9-30.	Yes...	9 a. m. 10-1.	1,579	Do.
13	10	...do.....	...do....	10	...do.....	6 p. m. 9-30.	Yes...	11 p. m. 10-2.	1,701	Do.
14	10	...do.....	...do....	10	...do.....	9 p. m. 9-30.	Yes...	5 p. m. 10-1.	1,830	Do.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Experiment No. 3.—Rabbits—Continued.

No.	$HgCl_2$ dose.	Method.	Time.	CaS dose.	Method.	Time.	Died.	Time.	Annual weight.	Remarks.
	Mgs.			*Mgs.*					*Gms.*	
15	10	Intravenously.	10 a. m. 9-20-23.	10	Intravenously.	3 a. m. 10-1.	Yes...	4 p. m. 10-3.	1,828	Diarrhea and drowsiness.
16	10	...do.....	...do....	10	...do.....	9 a. m. 10-1.	Yes...	3 p. m. 10-2.	1,940	Do.
17	10	...do.....	...do....	10	...do.....	9 p. m. 10-1.	Yes...	3 p. m. 10-2.	1,965	Do.
18	10	...do.....	...do....	10	...do.....	9 a. m. 10-2.	Yes...	9 a. m. 10-2.	2,195	Do.
19	10	...do.....	...do....	None.			Yes...	12 a. m. 10-2.	2,248	Do.
20	10	...do.....	...do....	None.			Yes...	2 a. m. 10-2.	2,673	Do.
21	10	...do.....	...do....	None.			Yes...	4 p. m. 10-3.	2,670	Do.
22	None.			10	Intravenously.	9 p. m. 10-1.	Yes...	3 p. m. 10-4.	2,430	Convulsions.
23	None.			10	...do.....	9 p. m. 10-1.	No....		2,550	Convulsions, but recovered.

It will be noted that the results in experiment No. 3 were one of almost uniform fatality. Controls were run using calcium sulphide alone in the same dosage on two rabbits. These two rabbits together with the majority of those in the experiment required resuscitation by artificial respiration almost immediately after the calcium sulphide was given. This was partly attributed to a possibly too rapid intravenous injection of the drug since, in a few instances, it was also necessary to give artificial respiration after the mercurial injections. However, one of these two rabbits which received CaS alone died on the third day after the administration of the drug. It will also be observed that the majority of the rabbits receiving treatment died more quickly than did the controls receiving $HgCl_2$ without any treatment whatsoever, and also that, generally speaking, the longer treatment was deferred the longer the rabbits lived.

Experiment No. 4.—Rabbits.

[$HgCl_2$ by mouth; CaS by mouth. (Stomach tube.)]

No.	$HgCl_2$ dose.	Method.	Time.	CaS dose.	Method.	Time.	Died.	Time.	Animal weight.	Remarks.
	Mgs.			*Mgs.*					*Gms.*	
1	150	By mouth.	3 p. m. 10-23.	150	By mouth.	3 p. m. 10-23.	Yes...	3 a. m. 10-24.	2,916	Combined control; diarrhea and drowsiness.
2	None.			150	...do.....	3 p. m. 10-23.	No....		3,037	CaS control: No symptoms.
3	150	By mouth.	3 p. m. 10-23.	None.			Yes...	11 a. m. 10-28.	3,030	$HgCl_2$ control; diarrhea and drowsiness.
4	150	...do.....	..do...	150	By mouth.	4 p. m. 10-23.	Yes...	1 a m. 10-24.	2,430	Diarrhea and drowsiness.
5	150	...do.....	..do...	150	...do.....	6 p. m. 10-23.	Yes...	4 a m. 10-24.	3,280	Do.
6	150	...do.....	..do...	150	...do.....	9 p. m. 10-23.	Yes...	2. p. m. 10-24.	3,282	Do
7	150	...do.....	..do...	150	...do.....	9 a m. 10-24.	Yes...	1 p. m. 10-28.	3,285	Do.
8	150	...do.....	..do...	150	...do.....	3 p. m. 10-24.	Yes...	4 p. m. 10-25.	2,920	Do.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It will be observed in this experiment also that there is a uniform fatality, that treatment seems to hasten death, and that only one rabbit receiving treatment lived as long as did the one receiving $HgCl_2$ alone. Particular attention is invited to rabbit No. 1 in this experiment. This rabbit received its treatment immediately after and on top of the mercury. One would surely expect this rabbit to recover, but it died almost as quickly as any. The CaS control rabbit recovered without symptoms as should be expected.

In connection with the above experiments it was found that the calcium sulphide used, when made up with the assumption that it was 55 per cent pure, would not combine with four times its weight of mercuric chloride, but only twice its weight. It was therefore considered about 25 per cent pure and the solutions in experiment No. 4 were made up accordingly. It would seem, however, that even though the dosage of calcium sulphide used in experiment No. 3 was only one-half the amount recommended, it should be sufficient since the dose actually given was enough to convert into HgS twice the amount of $HgCl_2$ administered.

Experiment No. 5.—Rabbits.

[$HgCl_2$ by mouth (stomach tube); CaS intravenously.]

No.	$HgCl_2$ dose.	Method.	Time.	CaS dose	Method.	Time.	Died.	Time.	Animal weight.	Remarks.
	Mgs.			*Mgs.*					*Gms.*	
1	60	By mouth.	3 p. m. 10-26.	None.			Yes...	12 p. m. 10-28.	1,458	$HgCl_2$ control; diarrhea and drowsiness.
2	60	...do.....	...do...	30	Intravenously.	3 p. m. 10-26.	Yes...	10 p. m. 10-28.	1,460	Combined control; diarrhea and drowsiness.
3	60	...do.....	...do...	30	...do.....	4 p. m. 10-26.	Yes...	6 a. m. 10-27.	1,215	Diarrhea and drowsiness.
4	60	...do.....	...do...	56	do.....	6 p. m. 10-26.	Yes...	2 p. m. 10-29.	1,700	Do.

It will be noticed again in experiment No. 5 that all the rabbits died after treatment and that death was not even retarded probably with the exception of rabbit No. 4, which lived a little longer than rabbit No. 1. A surely fatal dose of $HgCl_2$ was given, but not twice the fatal dose, since this would necessitate the intravenous injection of a comparatively large volume of fluid containing CaS, and it was considered advisable not to use a more concentrated solution than that recommended. Sufficient sodium chloride was added to the solution to make it isotonic. It was found, however, that only half the desired amount, in the majority of cases, could be given intravenously without producing convulsions. But the amount actually given was sufficient to convert into HgS twice the amount of $HgCl_2$ administered. Rabbit No. 4 received nearly enough of CaS

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to convert into HgS four times the amount of $HgCl_2$ given, but with fatal results.

In order to eliminate any possibility of mercuric sulphide itself being poisonous the following experiment was done: 100 mg. mercuric chloride was completely precipitated with calcium sulphide solution, and the precipitate, mercuric sulphide (HgS), washed and given by mouth (stomach tube) to a rabbit weighing 1,015 gms. This was repeated on a second rabbit of the same weight. No symptoms followed.

Conclusions and remarks.—1. It would seem that U. S. P. calcium sulphide of the nature of that usually procured from drug stores, even though manifesting the physical requirements of the Pharmacopeia, is of no value in the treatment of mercuric chloride poisoning and even may be dangerous.

2. The washed insoluble precipitate of mercuric sulphide is non-poisonous when given to rabbits by mouth.

3. It is believed that many cases reported to have been cured by the calcium sulphide treatment had not absorbed a fatal dose of mercuric chloride. The majority of cases reported had taken by mouth only one 7.5 grain tablet which, when compared with the minimum lethal dose per gram of body weight, is not a fatal dose for an adult, but only one-fourth the fatal dose, if human beings can be compared with rabbits. The fact that the patient usually vomits at least a part of the bichloride taken, frequently receives other treatment in addition, perhaps, such as gastric lavage, large amounts of water, purgation, etc., should be considered.

4. In spite of the fact that the above experiments reflect against the calcium sulphide treatment it is still believed that this form of treatment may be a valuable one if one can be sure that he has a good sample of the drug. We are now trying to procure some chemically pure calcium sulphide which will be experimented with and made the subject of a future report.

THE CONSTRUCTION OF VULCANITE PARTIAL DENTURES.

By L. M. Desmond, Lieutenant, Dental Corps, United States Navy.

Practically every man who constructs partial dentures has his own particular method and can achieve the desired results by that method. The writer does not claim that his procedure is the only one to be used, but feels that he can obtain the best results by using it. After a thorough examination of the patient's mouth and remaining teeth has been made, the hard and soft spots should be noted. A wax bite is then taken and casts poured for use as study

Digitized by Google Original from UNIVERSITY OF MICHIGAN

models. These study models enable one to determine the different lines of stress placed upon the contemplated denture so that the proper denture for the case can be decided upon. No time is wasted by taking these study models as they are obtained at the time that the impressions of the teeth to be clasped are taken. A simple pointer of Mr. Samuel Supplee's in taking the bite has been found useful. Place a sheet of tinfoil (60 gauge) between two sheets of baseplate wax and cut the wax to approximate the size of the arch of the teeth, warm the wax thoroughly, insert and have the patient close hard, then chill the wax and remove. The tinfoil will keep the wax from distorting upon removal from the mouth.

When the teeth to be clasped have been determined upon, separate impressions of these teeth are taken in plaster by the use of the small Roach hinged impression cups. A low fusing metal (Dee's) is poured into these impressions. If the clasps are to be cast, they are made on these metal molds by first coating the surfaces with glycerin and then using Kerr's 22 gauge sheet wax; cutting the wax the desired shape, placing on the occlusal rest (if one is used) and the lug which the vulcanite grips. Remove the carved wax clasp from the metal model very carefully so as not to distort, wash with alcohol, dry, invest, and cast. Ney-Oro "G" gold is used for casting. The width of the clasp is determined by the shape of the tooth; the wax being cut so the edge toward the occlusal and the edge toward the gingiva rests over the bulge of the tooth. This will prevent the clasp from moving upward or downward after the denture has been constructed. The writer also finds it easier to adapt the wax if it is cut on a curved line than a straight one as it is then more easily adapted around the metal model. Dr. W. C. Cummer's plan of types of denture determination has been found most practical and useful.

Much has been written both in favor of and against the cast clasp, but because of its adaptability and quickness of construction it has been found most practical. Movable attachments are also useful in some cases, especially those in which the teeth to be clasped are greatly out of alignment and are sometimes used. Stress breakers have also been found useful in some cases.

After the clasps have been cleaned, smoothed, and highly polished they are fitted on the teeth. A very small amount of properly heated modeling compound first being placed under the lug which extends from the body of the clasp over the mucosa. This small amount of compound will give an accurate impression of the mucosa beneath the lug and will prevent the clasp from being misplaced by the lug being tilted when the impression is taken; the plaster will also flow more readily about the lug. Another bite should now be taken with the clasps in position.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Impressions may be taken either by the sectional modeling compound method or by using sectional trays and plaster. The writer prefers the latter because of its quickness and the belief that plaster gives sharper and more definite detail. The sectional trays of the Union Broach Co. and Kerr's "Snow White" impression plaster have been found very satisfactory; also Weinstein's, Healey's, or Spence's "Artificial Stone" for models.

The clasps are placed in position, the plaster is flowed into the sectional tray and inserted in the mouth. It is allowed to set hard, then the trays are broken apart, removed, and reassembled. The impression is coated with sandarac varnish or any good separting fluid, boxed up, artificial stone is mixed, jarred into the impression and allowed to remain the length of time that the manufacturer of the stone states. After the stone has set, the model is removed, placed in the wax bite and mounted on the articulator. The artificial teeth are ground into occlusion, waxed up, and invested. The case is then packed, vulcanized, finished, and highly polished. When the completed denture is placed in the mouth, the artificial teeth are ground to finer occlusion by the use of articulating strips and carborundum powder mixed with glycerin.

The writer wishes to acknowledge and thank Dr. Alexander H. Paterson of Baltimore and Dr. W. C. Cummer of Toronto for their valuable aid and papers on denture construction.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CLINICAL NOTES.

CHRONIC DUODENAL ULCER.

By O. A. SMITH, Lieutenant (J. G.), Medical Corps, United States Navy.

A Veteran's Bureau beneficiary, painter by occupation, S. W. J., age 35, was admitted to the United States Naval Hospital, New York, N. Y., on August 9, 1923, complaining of pains in the region of the stomach, which began about an hour after meals and were followed by nausea and vomiting. The family history was negative. He had had an appendectomy in 1920, and was told by the surgeon that he had a chronic appendix.

Since 1918 he had suffered with considerable gastric discomfort. It began with pain in the epigastrium coming on an hour after meals. The pain was followed by nausea and vomiting which relieved it. He apparently recovered and had no trouble for about a year, when the same trouble recurred, the attack lasting approximately two months. After the appendectomy he had no trouble until his present illness, which began a month before admission, with sharp pains in the epigastrium an hour following meals, nausea and vomiting. There was no hematemesis, belching of gas or pyrosis. The pain was relieved by vomiting or by sodium bicarbonate in hot water. He was constipated and his appetite was poor. He had lost 25 pounds in the last year and complained of considerable nervousness.

The physical examination showed a poorly nourished, worried looking individual, weight 115 pounds, height 62 inches. The teeth were poor, the gums showed some pyorrhea. The abdomen showed the scar resulting from the appendectomy. It was not adherent. There was some tenderness in the epigastrium, but it was not marked. No tumors and organs were palpable. Feces were negative for occult blood. The blood count showed 3,840,000 r. b. c., 6,250 w. b. c., hgb., 80 per cent, 59 per cent neutrophiles, 40 per cent small lymphocytes and 1 per cent eosinophiles. Blood Wassermann and urine were negative. A fractional analysis following an Ewald test meal showed a hyperacidity. It was negative for blood. A barium series showed a dilated stomach with marked ptosis, the lower border being 1 inch below the crest of the ileum, and hypermotile. On the first part of the duodenum was seen the crater of an ulcer. A

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

gastric residue was present. At 24 hours the gastric residue was still present; 48 hours showed marked colonic stasis and a dilated transverse colon.

An attempt was made to relieve the patient without operation. He was first put on the Lenhartz diet. August 16 he felt some better. August 18 feces positive for occult blood. August 20 he complained of gas pains at night and constipation. August 22 he vomited his food and his diet was changed to Sippy diet with apparent benefit. He then improved up to September 8, and the feces remained negative for occult blood. On September 8 he vomited, and examination of the feces showed occult blood, but there was no abdominal distress. No change was made in the diet. September 15 he felt much better and was gaining weight. September 18 he vomited about four hours after eating, but had no pains. September 22 fractional analysis still showed a hyperacidity and feces were positive for occult blood. The Sippy diet was continued and he was gaining weight. It was not thought advisable to operate at this time, as chest examinations indicated that there might be a tuberculous infection. Repeated examinations of the sputum were negative for tubercle bacilli. October 9 he vomited his supper. October 13 his lung condition had cleared up and his appetite was improving. However, the anemia was increasing, there being only 3,248,000 r. b. c. and a 50 per cent hgb. October 16 he vomited three times during the night and once in the morning.

On October 19 there was an area of tenderness in the right hypochondrium about 3 or 4 inches, extending from the mid line to the right costal border. Chest examination showed breath sounds roughened throughout both lungs with prolonged expiration, most marked over right apex posteriorly. Subscrepitant rales were heard on expiration opposite the left scapula. October 22 a consultation was held with the surgical service. They advised operation. The blood was typed and matched so that a transfusion could be done if necessary. October 26 he was transferred to the surgical ward and the Sippy diet discontinued. His weight was then 98 pounds, a loss of 17 pounds since admission. He was given a modified Lenhartz diet. His general condition improved. An X-ray examination of the chest on November 6 showed marked and extensive fibrosis generalized in both lungs, including apices. November 7 the patient was operated upon. Previous to the operation the stomach was washed out and considerable detritus and residue from overnight was removed. The operation was a posterior gasteroenterostomy, with a short loop, the opening admitting two fingers. This operation was done almost entirely under local novocaine anæsthesia. Ether was given only while the peritoneum was being sutured. At operation there was seen in the first part of the duodenum, a hard in-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

durated area which in all probability was the ulcer. His postoperative condition was excellent, he vomited a little food but no blood. His convalescence was uneventful. The anemia decreased rapidly, the r. b. c. on November 29, being 4,710,000. December 17 he weighed 119 pounds, said that he had no more gastric discomfort, ate whatever he wanted to, his bowels move normally, and he felt better than he had for several years.

A barium series at this time showed the following: Size, position, peristalsis, and motility of the stomach normal. Anastomosis good, no barium passing through pylorus, cap not visible, some gastric residue at 6 hours, at 24 hours dilated colon and ptosis of proximal end of transverse colon; at 48 hours, delay in emptying. Improvement noted since last film, in that there is less residue, less colonic stasis, and less delay.

This case is interesting in that it presents almost a typical picture of chronic duodenal ulcer, which is most common in males from 25 to 45 years of age. An ulcer may run its course without definite symptoms and undergo healing by cicatrization, or be discovered accidentally at autopsy. It may remain latent for an indefinite period of time and finally become apparent by symptoms of hemorrhage or perforation; or, as is generally the case, and which happened here, it may occasion a symptom complex in which the usual phenomena of indigestion appear and are followed after an interval of weeks, months, or years by such definite indications as pain, tenderness, vomiting, hemorrhage, and hyperchlorhydria.

The true cause of peptic, post-pyloric, or gastric and duodenal ulcers is not known. They have been ascribed to various causes and factors, such as direct irritation or traumatism, toxemia, hyperacidity with deficient mucous secretion, and devitalizing anemia. At least these are the most important associated conditions. Foci of infection, such as the appendix, which in this case was removed between attacks, are important antecedent factors and may even be the determining cause.

Most ulcers are found just outside of the pyloric sphincter, as this one was. This part of the duodenum is deficient in blood supply as compared with the rest of the duodenum. Osler thought that it is probably due to a bacteriological infection of the mucosa, the source being some focus in the territory of the portal vein, particularly the appendix. It seems reasonable to assume that this ulcer was originally due to an infection from the appendix. It could not heal even after the foci of infection was removed because of the hyperacidity of the gastric secretion which was on a submucosa deprived of its overlying epithelium.

The ulcers may be either acute or chronic. Acute ulcers are small, punched out, edges clean cut, the floor smooth, and the peri-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

toneal surface not thickened, while the chronic ulcer is of larger size, edges indented, and the border is sinuous. They may reach an enormous size, especially if they spread beyond the pyloric sphincter. In larger ulcers which have involved the muscular coat, the cicatricial contraction may cause a pyloric narrowing and consequent dilatation of the stomach, which was probably the cause of this patient's dilated stomach.

The symptoms of an acute and an active or extremely irritable chronic ulcer are practically the same, namely, pain, localized tenderness, vomiting, and hemorrhage. The tendency of the pain is to increase in its intensity as the attack progresses and immediate relief is obtained by vomiting which may be induced or involuntary. Any actual abdominal pain which occurs for several weeks in the same region is almost positive proof of a lesion of the stomach, duodenum, appendix, or gall bladder. If this pain bears a certain relation with reference to its appearance and varies only with the size of the meal, it is very suggestive of ulcer of the stomach or duodenum.

Localized tenderness is important only when it is distinctly circumscribed. It is commonly epigastric and a little to the left of the midline (in this case it was to the right). When the lesion is at or near the pylorus there may be tenderness at the level of the fourth and fifth dorsal spines.

Persistently recurrent vomiting of a definitely periodic type is strongly suggestive of ulcer but it must be associated with other corroborative symptoms. The vomiting usually takes place between one and three hours after the meal is taken. In this case it occurred about an hour after meals.

Hemorrhage occurs more frequently in acute than chronic ulcers. The blood may be either visible or occult. Both the stools and stomach content should be examined for visible and occult blood The vomitus of this patient never showed any visible blood. Occult blood was found in the feces only twice.

The fractional analysis showed a constant hyperacidity. Hyperchlorhydria is a common condition without ulcer, but decided hypoacidity goes far to exclude ulcer. Excessive amount of hydrochloric acid associated with probable ulcer symptoms usually point to an ulceration at or near the pylorus with prolonged retention of food. It is to be noted here that a gastric residue was seen by means of the X-ray and also when the stomach was washed out before operation. Hyperacidity in chronic ulcers is important because it is present in between 80–85 per cent. Consideration of these facts is of value in relation to the early diagnosis of carcinoma. If signs and symptoms of chronic juxtapyloric ulcer are present and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

free hydrochloric-acid values are low or progressively falling; an exploratory incision is imperative.

The Roentgen ray is the most valuable aid in making a diagnosis of duodenal ulcer. The two important signs are cap deformity and the formation of a diverticulum or accessory pocket. The cap deformity is constantly present though it may be difficult to demonstrate since its outline sometimes occurs in an inaccessible part of the cap. However, a negative diagnosis is justified when a normal cap is clearly seen. Failure to see the cap does not justify a diagnosis of ulcer, but this in connection with hyperperistalsis and delayed emptying time justifies a probable diagnosis. Here the crater of the ulcer was seen, also hypermotility and a gastric residue. Gall-bladder disease may deform the cap by direct pressure or adhesions. When a diverticulum is observed we have distinctive evidence of a duodenal ulcer. There are several minor signs of duodenal ulcer such as hypermotility and rapid emptying of the stomach; lagging of barium in the duodenum (this is significant when there is a tender presspoint); intestinal hypermotility; gastric hypertonus; hyperperistalsis; delayed gastric evacuation resulting in a five or six hour gastric residue which in this case was very marked. The latter is present in about 40 per cent of the recognized cases of duodenal ulcer, hence its importance.

The treatment of ulcer of the duodenum may be either medicinal or surgical. The principles of the former are, control of the foci of infection, obtaining gastric rest as far as possible, and the neutralization of acidity. Medical treatment should be tried unless there are definite indications for operation. The control of infection demands proper treatment of any foci as in the mouth or appendix. Either the Lenhartz or the Sippy diet may be used to obtain gastric rest and neutralize gastric acidity.

The medicinal treatment is essentially dietary, which this patient received for nearly 10 weeks. No improvement was noted while on the Lenhartz diet except slight relief from pain. While on Sippy diet some improvement was noted in that he gained a little weight, but vomiting continued intermittently, and there was still a marked hyperacidity and examination of the feces showed occult blood. Due to the persistence of the symptoms the decision was made to operate. The surgeon has the choice of excising the ulcer, with or without gastrojejunostomy or doing a gastrojejunostomy alone. In this case the operation done was a posterior gastroenterostomy without excision. Excision of the ulcer would have subjected the patient to the added danger of hemorrhage and he was already very anemic. The posterior gastroenterostomy is the operation of choice in that it removes irritants from the scar,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

allows of early administration of food, favors healing, and antagonizes recurrence. The benefits derived from this operation are soon lost if food continues to pass through the pylorus. The X-ray taken five weeks after the operation showed no food passing through the pylorus and it is not thought likely that this patient will have a recurrence.

MALIGNANT ENDOCARDITIS FOLLOWING FRACTURE OF THE RIBS—A CASE REPORT.

By B. M. Summers, Lieutenant (J. G.), Medical Corps, United States Navy.

J. A., white, male, weighing 140 pounds and about 5 feet 6 inches tall, was admitted to ward F–2, United States Naval Hospital, Brooklyn, N. Y., December 10, 1923, with diagnosis undetermined.

History as follows: On December 10, 1923, patient lost his hold on a ladder on the U. S. S. Arkansas and fell through four hatches to the bottom deck of the ship. He was unconscious for about one-half hour, and when he recovered he complained of pain over his eighth and ninth ribs.

Physical examination on admission to hospital showed a wound of the scalp over the lower part of the left parietal region, contusions over the left ninth and tenth ribs and corresponding interspaces in the midaxillary line. Antero-posterior compression of ribs caused pain at the site of contusion. No friction rub could be heard. There was a small abrasion on the upper right arm, medial side. Patient had less pain when he lay on his left side. There was a loud blowing systolic murmur heard at the apex of the heart. Point of maximal impulse was in the sixth interspace 1 centimeter medial to the nipple line. Murmur was thought to be probably due to an endocarditis.

Subsequent Course of Case.—On December 11, 1923, the white blood count was 8,900; neutrophiles, 68; lymphocytes, 24; large mononuclears, 3; transitionals, 3; eosinophiles, 2. Urine showed a few erythrocytes. Wassermann was negative. The eighth and ninth ribs left side were strapped with adhesive.

December 14, 1923, patient seemed to have considerable distress on his left side over ninth and tenth ribs in axillary line. Breathing was diminished on left side. Percussion over lower left four ribs was painful to patient, as was antero-posterior compression of left chest. No friction rub was heard over ninth and tenth left ribs near site of injury. Temperature in the evening had gone up to 103° F. Loud blowing systolic murmur was still present at apex of heart and transmitted to axilla. It was thought to be a murmur of mitral regurgitation by Doctor Cuthbertson. Pulmonic second

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sound was accentuated. Left border of the heart was one finger's breadth external to the nipple line.

On December 15, 1923, the left chest was strapped with adhesive with relief to patient. Evening temperature 102° F.; pulse, 98; respiration, 28. There was some congestion in the left lower lobe and rales in upper lobe left lung. X-ray report showed possible fracture of ninth rib.

On December 16, 1923, the temperature at 11 a. m. was 103.8° F.; pulse, 98; respiration, 28. Lower lobe left lung showed dullness on percussion. During the day patient took liquid nourishment and rested fairly well. Blood culture was taken in the afternoon.

On December 17, 1923, the blood culture was negative after 18 hours. White blood count, 11,500; neutrophiles, 82; lymphocytes, 17; eosinophiles, 1. Patient complained of pain in his chest. Treatment was symptomatic. Intake fluid during current 24 hours, 2,440 c. c. Output urine in 24 hours was 945 c. c. Temperature at 11 p. m. was 105.5° F.; pulse, 120; respiration, 34. General condition of patient was worse. Chest condition the same.

On December 18, 1923, the diagnosis changed from undetermined to fracture, simple (ninth rib); origin, duty. Condition as above stated. White blood count, 11,400; neutrophiles, 89; lymphocytes, 7; large mononuclears, 1; transitionals, 1; eosinophiles, 2. The lower lobe of left lung showed dullness to percussion with moist râles above consolidated area, also in middlelobe of right lung anteriorly and over both upper lobes. There was bronchial breathing over both upper lobes anteriorly. At times during the day the patient had a low muttering delirium, but when spoken to he aroused and answered rationally. Patient complained of pain in the lower dorsal region. Digitalis, 1 cubic centimeter, was given hypodermatically every four hours until three doses were given. Intake of fluid by mouth for past 24 hours, 2,130 cubic centimeters; output urine, 480 cubic centimeters. S. S. enema was effectual. Cold sponges given at two-hour intervals to reduce temperature. Afternoon temperature 104.8° F.; pulse, 120; respiration, 43. Patient much worse.

The diagnosis changed from fracture of rib to pneumonia lobar; origin, duty; due to traumatism to left side on December 19, 1923. The question of an old cardiac condition being lighted up was brought to view by the above-described mitral murmur, and his hyperpyrexia—105.5° F. at 7 a. m. Patient became unconscious during the morning. A petechial rash appeared on the arms, abdomen, and about the chest, spreading rapidly, and with a tendency to be scarlatiniform. This skin condition was faintly evident at noon and markedly so in the evening.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Doctor Higgins was asked to hold a medical consultation on the patient, and reported the following findings at noon December 19, 1923.

Examination of chest negative except for a few crepitant râles in left axilla. Pupils equal and react sluggishly to light. Patient in stupor. Patient hyperemic and small vesicular rash over body. Neck retracted. Kernig partial 100°. No knee jerks. Achilles normal, slight tendency to ankle clonus. Plantar reflexes erratic, tendency to Babinski left side. Abdomen rigid, tympanitic, liver dullness obliterated largely.

Meningitis (streptococcus?) was suspected. A spinal puncture was recommended, together with rectal injections 250 c. c., glucose 5 per cent, soda bicarbonate 5 per cent.

A spinal puncture was made at 1 p. m. and a clear fluid obtained, no increase in pressure. Laboratory examination of same spinal fluid showed it to have a normal cell count, to be positive for sugar and globulins not increased. A smear showed one pus cell. Cultures were negative for organisms.

X-ray of chest showed the heart to be well over to left side, with obliteration of angle between diaphragm, parietal pleura, and heart, the area being clouded. This area was in the region where percussion demonstrated dullness posteriorly over lower lobe.

Inspection of the X-ray picture previously taken showed a possible dislocation of the head of the twelfth right rib. Red blood count, 3,100,000; white blood count, 18,000. Intravenous saline solution 500 cubic centimeters was given at 7 p. m. Blood pressure, 120 systolic, 90 diastolic. Patient was unconscious and had a marked Kernig on left side and a complete flaccid paralysis on left side. A positive Babinski and Gordon sign were present on left side. Digitalis was given at intervals during the day. Temperature at 11 p. m. 105.5° F.; pulse, 150; respiration, 65.

A special eye and ear examination was made by Doctor Cannon and the following findings reported:

"Patient unconscious, condition critical. There is no evidence of pathology in either ear. The right pupil appears normal in size and reacts to light. On account of extreme deviation inward the fundus can not be studied. From this deviation we are of the opinion that there exists a paralysis of the right rectus muscle. The left pupil is contracted but reacts somewhat to light. The deviation to the left is present, but not so extreme, and is variable in degree. The fundus can not be satisfactorily studied."

December 20, 1923, temperature 105° F.; pulse, 158; respiration, 65 at 3 a. m.; at 5.20 a. m. pulse 160, respiration 34; at 5.25 a. m. pulse 100, respiration 10. Patient died in a few moments.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Report of autopsy.—The body was that of a well-developed and well-nourished white male about 28 years of age, about 5 feet 5 inches in height, weighing about 140 pounds.

There is a laceration of the scalp 2 inches above the left ear, abrasion of inner surface of right arm, broken bullous lesions on right side of chest, and numerous pin point pustules scattered over chest, abdomen, left forearm and arm. Petechial hemorrhages in skin of right forearm and arm. Eccymosis about nail of left index finger. Moderate rigor mortis of legs, less marked in arms, but movement of neck free. Pupils 6 millimeters in diameter. Mucous membrane not cyanotic.

Head.—No fracture of skull. Dura was thickened and covered with partly organized fibrinous exudate over vertex. Hemorrhagic area about 5 by 3 centimeters in same portion of dura.

Small areas of purulent exudate seen in pia mater over vertex and over medulla. Culture taken. Meninges congested. Brain showed no pathology.

Thorax.—On incision, skeletal muscles dark in color. Lungs found partly collapsed. Heart extended 3 centimeters to right of mid-external line. Puncture wound about 2 centimeters long in parietal layer of pleura on inner surface of seventh rib slightly anterior to mid-axillary line. Fracture seventh rib. Similar puncture wound about one-half centimeter deep through visceral layer of pleura and into lung. Possible dislocation twelfth rib same (left) side.

Lungs normal in color and appearance except at region of puncture which was in lower lobe left side and at base of left lower lobe. On section in left lower lobe small amount of pus exuded from the bronchioles with considerable blood. Few fibrinous adhesions between layers of pleura posteriorly.

Pericardial fluid normal in amount.

Heart dark red in color; epicardium smooth and glistening with numerous petechial hemorrhages under it. Myocardium of left ventricle 18 millimeters in thickness; of same dark color as skeletal muscles, firm, with no evidence of fibrosis. Endocardium showed small, grayish red spots about half millimeter in diameter. Vegetative growths about 1 to 2 millimeters thick on cusps of mitral valve, which were of light yellow color and firmly adherent. Aorta showed no pathology.

Abdominal cavity.—Peritoneum over intestines showed numerous grayish yellow spots about 1–2 millimeters in diameter. No fluid in peritoneal cavity. Few fibrinous adhesions between intestinal loops.

Liver about 1,600 grams in weight; brownish-red in color, capsule smooth and glistering, studded with numerous minute grayish-white

Digitized by Google Original from UNIVERSITY OF MICHIGAN

nodules, and many regions discolored by the presence of anemic infarcts, which cut with increased resistance. The liver substance offers the usual resistance to the knife. The cut surface was of a uniform brownish-red color, neither bulged nor retracted. Gall blader thin-walled; not pathological and containing 40 cubic centimeters dark green bile, but no stones.

Spleen 17 by 9 by 6 centimeters. Capsule studded with nodules similar to liver nodules. The organ is cut easily, and is very friable. No structure can be made out.

Pancreas apparently normal.

Kidneys: Right, 13 by 5 by 3 centimeters; left, 12 by 6 by 3 centimeters; dark red in color, smooth transparent capsule, studded with some nodules as liver and spleen. Strips easily. On section cortex is of normal thickness, pyramids well seen, but there is no congestion.

Appendix, bladder, and prostate apparently normal.

Pathological diagnosis: Purulent meningitis; vegetative endocarditis; bacteremia; acute bronchitis; lobular pneumonia; multiple infarcts of liver; acute nephritis; fracture left seventh rib; laceration lower lobe left lung.

Discussion of case.—This case presents an interesting picture because of the rapidity of the course which it followed and because of the difficulty of diagnosis, nothing being exactly and completely typical clinically.

To review briefly: A young man apparently healthy, suddenly looses his hold on a ladder of the U. S. S. *Arkansas* and falls through four decks to the bottom of the ship. He sustains several minor body bruises and a fracture of the left ninth rib. He was unconscious for one-half hour. When brought to the hospital he had a loud blowing systolic murmur at the apex and except for pain over site of fracture his history and physical findings were negative. After three days he suddenly develops a high temperature which gradually increases, finally reaching 106° F. Patient becomes delirious on the eighth day and develops signs of meningitis with a petecheal rash on arms and body. He had signs of pneumonia in left lower lobe and some evidence of an enlarged spleen.

Clinically, this patient could have been diagnosed fracture of left ribs, malignant endocarditis, lobar pneumonia, meningitis, and septicemia with enough evidence for each diagnosis and with as much evidence lacking as far as laboratory tests are concerned to sustain either diagnosis. The autopsy later sustained all of the above-named diagnoses.

This patient had the high fever of a septicemia and of acute endocarditis, but until 24 hours before death the white blood count was low and blood culture was negative. These factors are against

Digitized by Google Original from UNIVERSITY OF MICHIGAN

septicemia. In lobar pneumonia one would expect a white blood count of from 15,000 to 30,000. The spinal fluid was absolutely negative, yet the patient had physical signs on the last day of a definite meningitis.

All in all the diagnosis of malignant endocarditis fits in with the clinical findings as well as any of the other diagnoses and more so with the laboratory findings.

Quoting from Norris and Landis on Diseases of the chest: "Malignant endocarditis occurs in young adult life as a rule and is engrafted upon an old mitral lesion. It is generally associated with some injury which introduces bacteria into the body and lowers the body resistance." "It usually assumes one of three forms: (*a*) Typhoid type, characterized by high fever, occasional diarrhea and deliriousness; (*b*) pyemia form, in which there is a demonstrable form of infection; (*c*) cardia type, with irregular fever and an increase in cardiac symptoms."

"*The embolic phenomena*, although sometimes absent, are the most certain indications of septic endocarditis. A rash of petechial type is quite common in endocarditis."

Certainly this case fits in fairly well with the textbook picture of malignant endocarditis both as to history, final outcome, and subsequent autopsy findings. A nice question arises as to whether or not his original fall on the U. S. S. *Arkansas* may not have been due to a sudden syncope from his old heart lesion. Personally, I am inclined to believe this may have been the case, since the man was climbing stairs at the time of his fall.

Treatment in this case was nothing more than supportive and eliminative and, as might have been expected, was of no benefit.

INCONTINENCE OF URINE.

By E. M. Harris, Jr., Lieutenant (J. G.), Medical Corps, United States Navy.

B. C. D. (colored), aged 39, was admitted to the United States Naval Hospital, New York, as a patient of the Veterans' Bureau, complaining of incontinence of urine, some pain in the region of the bladder, irregular chills, and occasional night sweats. He gave a history of gonorrhoeal infection of the urethra acquired in 1916 with a discharge which persisted for 8 months. Early in 1918 he began to suffer from frequent urination and later in that year he began to notice dribbling of urine and to experience a sensation of incomplete voiding. For the past three years he had been unable to work as a hotel waiter because of the dribbling of urine and consequent odor. The symptoms increased in severity and on his admis-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sion to the hospital he was required to get up two or three times a night to pass urine.

Examination of the urethra revealed a linear stricture 3½ inches from the meatus and an almost impassible stricture about one inch behind. With great difficulty a filiform was passed into the bladder. This stricture was finally dilated slightly and 850 cubic centimeters of residual urine were withdrawn through a small catheter and some one-half of 1 per cent mercurochrome solution was instilled into the bladder and urethra. The prostate was large and boggy: culture of the urine showed a coli infection.

As soon as the stricture would permit the passage of a No. 16 French sound the dribbling stopped, and the patient was able to pass a fair-sized stream without difficulty. After a month of treatment a No. 20 French sound passed without difficulty and the patient's symptoms disappeared. He was able to resume his occupation as a waiter.

Incontinence may be considered under the following types: (*a*) True incontinence and (*b*) false incontinence.

True incontinence is that condition in which the urine escapes from the bladder without previous urgency or desire. It is thus differentiated from false incontinence in which frequent desire to urinate is an outstanding subjective symptom.

Guyon tabulates true incontinence as follows:

- Incontinence
 - Without material lesion of urinary tract.
 - Incontinence of nerve lesions.
 - Incontinence from nervous aff.
 - Incontinence of children.
 - With material lesion of urinary tract.
 - Without retention.
 - Mech. and traumatic.
 - Incontinence of tuberculosis.
 - Incontinence of urethral insufficiency.
 - With retention.
 - Enlarged prostate.
 - Urethral stricture.

The case reported above is a typical case of incontinence with retention due to a lesion of the urinary tract in the form of urethral stricture.

There is history of previous injury to the urethra by gonorrhoeal infection. A few years later (1918) disturbance of urination appeared in the form of frequent urination and later dribbling. The two most common lesions of the urinary tract which cause incontinence with retention are enlarged prostate and stricture. Thus when incontinence with retention exists these two lesions should be borne in mind and a careful examiation be made to determine which is responsible for the trouble. This usually can be accomplished by sounding the urethra with acorn bougies and palpation of the prostate.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

In regard to history, both types usually recount frequent urination with difficulty in starting the stream. The following points are of value in determining the seat of the lesion. In cases of enlarged prostate nycturia is a most annoying symptom with difficulty in starting the stream. The urine usually flows freely during the day.

In the case of stricture frequent urination during the day is noticed. There is less difficulty in starting the stream, but dribbling usually is a prominent symptom. Nycturia appears when the stricture becomes well established.

In the case reported the incontinence was due to the retention resulting from stricture of the urethra. Treatment was therefore directed to the relief of the retention rather than to the incontinence. The retention being due to urethral stricture, this was overcome by dilating the stricture with bougies, sounds and theKollman dilator. When the stricture was dilated to 30 F. with the Kollman dilator, the patient was able to control his urine, have normal desire to urinate and direct a good stream. Symptoms of incomplete voiding and dribbling disappeared.

Incontience in adults is a fairly common complaint; especially among those classes where venereal disease is prevalent and ignorance or indifference on the part of the patient allows the condition to go untreated. The effect produced upon both the mental and physical status of the patient may become serious if the incontinence is improperly treated and allowed to continue.

This was well demonstrated in the above case. The patient had previously been a hotel waiter. His work compelled him to pay attention to his personal hygiene. When he began suffering with incontinence he sought treatment and during a period of about five years he was treated by a number of specialists. His condition seemed to grow worse instead of improving. He was forced to give up his work, abandon society, and wear a rubber urinal constantly. The patient was becoming despondent and showed various manifestations of mental disturbance from constant worry over his condition and insomnia. Normal sexual impulse was gone and the patient was beginning to show signs of emaciation suggestive of intercurrent disease. Following dilation of the stricture and the return of normal urinary function, the patient's attitude became more cheerful and he was anxious to return to his former work.

During a period of three months observation this patient has been seen to gain weight and strength, his mental symptoms disappeared and he has returned to his former work.

During the past two months the urinary function has been normal and normal sexual impulse has returned.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

REPORT OF A DEATH OCCURRING DURING TREATMENT FOR LEPROSY WITH CHAULMOOGRA OIL DERIVATIVES.

By F. L. McDANIEL, Lieutenant, Medical Corps, United States Navy.

In 1921 while the writer was treating the inmates of the leper colony at Christiansted, St. Croix, with hypodermic or intramuscular injections of chaulmoogra oil derivatives, a death occurred which appeared at the time to be the direct result of the treatment. A synopsis of this case was made at the time and may be regarded as of sufficient interest to publish. The writer is well aware that the record of this case which he has preserved is none too full and that no definite conclusions can be drawn therefrom.

Patient P. P. was admitted to the leper asylum, February 15, 1911. Examination records made at that time state that patient had light areas on skin of face and body which had appeared five months previous to admission.

Examination of patient in June, 1918, is recorded as follows: Adult male negro, somewhat dwarfed in stature. Entire facial area, including ears and nose, covered with marked nodular eruptions giving typical facial expression of leontiasis. Ulcerations of the nasal septum are present. The voice is husky suggesting laryngitis. Heart and lungs apparently normal. Fingers slightly flexed with a swollen appearance. There is almost complete absence of tactile sensation over entire hand with diminution of sensation over forearms. Nasal smear and smear from ulcerations on body positive for lepra bacilli. Wassermann reaction negative.

During his residence at the leper asylum the patient had no serious illness. He was always able to be up and about and to do light work. For the past four years he suffered from huskiness of voice, which, however, caused him but little distress.

On September 28, 1921, in company with 35 other lepers, the patient received his first injection of 1 cubic centimeter of chaulmoogra oil derivatives. The material for the treatment was obtained from the United States Public Health Service station in Honolulu and consisted of the ethyl esters of the fatty acids of chaulmoogra oil.

Within a few hours after this injection the patient developed a temperature of 100° F. He also complained of pain in his right arm. For the next five days his temperature varied from 99° F. to 100° F.

On October 5, 1921, he received an injection of 2 cubic centimeters of the oil derivatives. No reaction followed this injection, except pain continued in the right arm, and he also complained of occasional fleeting pains in both legs.

On October 12, he received an injection of 2 cubic centimeters. Fever again appeared accompanied by rather severe pain in arms and legs. Cough and symptoms of acute bronchitis developed.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

On October 19 patient received an injection of 2 cubic centimeters. The above-enumerated symptoms became very much exaggerated. Patient was confined to his bed and suffered considerable pain in upper and lower extremities. On October 22 he appeared much improved, although continuing to run a low-grade fever.

On October 26 he received an injection of 2 cubic centimeters. The pain in arms and legs returned, accompanied by elevation of temperature to about 101° F. On October 30 the pain and fever subsided, but patient complained of considerable weakness.

On November 2 the injection of the oil derivatives was reduced to 1 cubic centimeter. Within a few hours the patient began to complain of itching all over his body. Fever and pain in legs reappeared. The usual huskiness of voice seemed more pronounced. On November 7 the patient felt much better and was allowed to sit up.

On November 9 the regular weekly injection was due, but was omitted on account of patient feeling weak and continuing to have fever.

On November 14 patient had an asthmatic-like attack, experienced difficulty of breathing, wheezing, etc. Heart action was rapid, but regular. Height of attack lasted about two hours, when patient became more comfortable. During the attack patient was given morphine and atropine and also adrenalin by hypodermic injection with inhalations of tincture of benzoin. On November 16 patient was much improved. On November 18 was able to sit up out of bed and continued to improve.

Since the beginning of treatment patient had been losing weight rapidly, although on a forced diet. No noticeable change had taken place in ulcerations or nodules.

On November 23 patient received an injection of 1 cubic centimeter of the chaulmoogra oil derivatives. In the afternoon of the following day patient suffered another attack of dyspnoea of a severe nature. Became rapidly worse. Morphine and atrophine seemed to afford some relief and patient rested quietly during part of the night. At 6 a. m. November 24, pulse became very rapid and irregular, breathing became extremely labored, was unable to speak, and exhibited symptoms of laryngeal oedema. At 10 a. m. adrenalin hypodermatically afforded some relief. At 12 noon the pulse was weak and irregular, the respiration shallow and difficult. Patient died at 1.30 p. m.

No necropsy performed.

Comment.—Among the 35 other leper patients receiving injections of chaulmoogra oil derivatives, only a few reactions were noted. These reactions consisted principally of elevation of temperature, malaise, pains in joints, and in one or two cases, the appearance of a

Digitized by Google Original from UNIVERSITY OF MICHIGAN

decided maculo-papular rash over the body. When a reaction occurred, it usually began within 6 to 12 hours after the injection, and in the milder cases was of no more than 24 hours to 48 hours in duration.

Inability to obtain an autopsy and thereby determine the pathological cause of death, renders the report of this case incomplete, however, from the clinical standpoint there appears to be a direct connection between the treatment as administered by intramuscular injection with chaulmoogra oil derivatives and the fatal termination of this case.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS.

GERMAN HOSPITAL SHIPS DURING THE WORLD WAR.

A report by the Director General of the German Navy, Prof. Dr. M. zur Verth, entitled "The Hospital Ship with Special Relation to Events During the War from 1914 to 1918 in the German Navy," has recently been translated by Commander F. B. Stephenson (Medical Corps), United States Navy, retired. As the report is a volunminous one, the arduous work of translation has been no small task, and we wish to express our appreciation of his services. This abstract omits many details of this report which have no special interest for our medical officers. The discussion of the conversion of vessels of the merchant marine to "high seas hospital ship" and "auxiliaries" is very complete but adds little to the information we already possess. Commander J. J. Snyder's article on "The Equipment of Transports During the World War," published in the United States Naval Medical Bulletin, Volume XVIII, No. 2, and the pamplet prepared by the Bureau of Construction and Repair on the conversion of merchant ships, describe the methods we used in solving the problems of sanitation and equipment. As a general principle for conversion of hospital ships the nearer we conform to the ideal the more successful we will be. Commander E. M. Blackwell (Medical Corps), United States Navy, describes an ideal fleet hospital ship in the Naval Medical Bulletin, Volume XII, No. 3, based on his experience while serving as executive officer of our hospital ships during two tours of duty. Director General zur Verth includes in his report the basic idea for building a hospital ship.

Drowning is probably the cause of the greatest number of casualties in action. The German hospital ships and auxiliaries were equipped with elaborate rescue apparatus and the smaller combatant vessels on the scene of action were always available for rescue work unless actively engaged. Director General zur Verth describes in detail the various types of rescue apparatus and gives instructions for their use.

The small auxiliary hospital ships, partially equipped, were found most useful to the German Navy in conducting their operations. These were stationed along the coast at strategic points to act as rescue ships and medical transports. The English used the larger auxiliaries for medical transports, as their problem was to evacuate

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the sick and wounded from greater distances. In the Russo-Japanese War some of the Japanese vessels were only equipped to care for the wounded a few days. The greater the distance the scene of the naval action is from the base of operations the more nearly should the equipment of the medical transport correspond to that of the ideal hospital ship. Although the Geneva Convention does not specify "types" of hospital ships, except military and non-military, it is generally understood and accepted that these vessels should conform to the conditions for which they are used. In our Navy we speak of hospital ships, class A, which means fully equipped mobile hospitals either built as such or converted to approximate the ideal, and of hospital ships, class B, which includes all vessels used as medical transports, the larger ships for distant operations and the smaller for use near the home base. Hospital ships, class B, may include craft for shallow or inland waters and river service.

As to the comments by Director General zur Verth on the command of hospital ships, it is believed that it is advisable to have a Hague Conference decide many questions that are still uncertain. During the World War the international guaranties for the hospital ship failed to give protection, and at a time when distrust and suspicion prevails changes can not be made. For twenty years by interpretation and practice it has been considered that line officers on duty on a hospital ship endanger neutrality, yet there is no article in the Hague Convention that specifically prohibits it. In fact, by applying to naval warfare, article 2 of the original Geneva Convention it may well be argued that they are included in the staff for *superintendence*, *administration*, and *transport of wounded*, and therefore should participate in the benefits of neutrality while so engaged. So long as our hospital ships are classed as "naval auxiliaries" they must be manned by the line personnel in accordance with the act of Congress, August 29, 1916. The command must also be from the line, for by the act of March 3, 1899, a medical officer can only command in his own corps. Our national laws, therefore, are in conflict with the interpretation of the international agreement, hence it would be well to have this clearly understood before we are involved in another war in which we are expected to comply with the Hague Convention. Under the Act of March 3, 1901, the hospital ship need not necessarily be classified as an auxiliary and therefore would not be included in the provision of the law of 1916. On the other hand, in time of war there must be governmental control of the officers of a military hospital ship, and members of the Naval Reserve would undoubtedly have to serve on board.

For the rapid transfer of wounded at sea the "double litter," described by Director General zur Verth, apparently solves a difficult

Digitized by Google Original from UNIVERSITY OF MICHIGAN

problem. It can perhaps be best described as a modified "cargo net" which is handled by the ship's crane. "Transport hammocks" were used on the German hospital ships and placed directly on the double litter. When the hospital ship can go alongside a transport or wharf the swinging cot used by the British is considered to have many advantages. The patient can be transferred in this cot by ambulances and train to the base hospital without change. It is not unlike the Wells' cot that was in use in our service for many years.

The following is an abstract of Commander Stephenson's translation of this report of the German hospital ships:

"Preparation of certain merchant ships in times of peace permitted conversion to hospital ships in a few days. The smaller auxiliary hospital ships were converted at the Government dockyards, Wilhelmshaven and Kiel, and the high sea hospital ships at Bremerhaven. The first type required 2 to 3 days; the second type 7 to 10 days. The largest number of these ships were on duty in the North Sea. In the Baltic there was only one high sea and one auxiliary hospital ship. The high sea hospital ships were detailed to squadrons for which they cared in part; others were held at relief stations. The auxiliary hospital ships were used to transport the sick and wounded. Later on, when no sea fight occurred, the hospital ships were stationed at various ports along the coast instead of with the squadrons. Finally all but one, the *Sierra Ventana*, were taken from active service. The hospital ship in the Baltic, the *Schleswig*, served as a hospital in the captured harbor of Kurland, and the auxiliary attended the mine force and served as a transport for the sick from Finland. The greatest service of the hospital ships was performed in the North Sea battle, off Skagerrack, and the operations against the Baltic Islands. After the battle of the Skagerrack, three auxiliary hospital ships brought to the naval base 168 wounded and 52 dead. The hospital ship *Sierra Ventana* took on board a large number of wounded and shipwrecked. During the expedition of Osel (1917) 4 auxiliary hospital ships brought, in 10 trips, 906 wounded. During the entire period 3,937 were treated on hospital ships and 7,854 were transported on the auxiliaries.

"The *Sierra Ventana* was kept ready, with banked fires, for instant movement, during the entire war. After the battle of Skagerrak 271 wounded were received. After the Dogger Bank engagement 15 wounded were taken on board. Altogether this ship cared for 2,971 men, with 79,722 sick days; of these 2,918 were of the navy and 50 of the merchant marine. As an example of work done by a hospital ship in war time, the surgical section cared for 1,847 patients, of which 1,414 returned to duty, 386 were unfit for duty, and 39 died. There were 932 major operations; of these 24 were on the head, 16

Digitized by Google Original from UNIVERSITY OF MICHIGAN

on the neck, 15 on the chest, 505 abdominal, 14 of the upper trunk, 235 on the lower trunk, 123 on the genitalia. There were 3,611 patients examined by X ray. In the medical section 1,071 sick were treated, of which 779 returned to duty and 308 were unfit. Thirteen patients died. The dental section treated 25,866 patients in the fleet. The laboratory made 8,765 chemical and bacteriological examinations. Attention was paid to the general welfare of the patients by lectures, moving pictures, gifts of tobacco, candy, books, etc. Supplies of clothing were kept on board for the shipwrecked.

"The main duty of the hospital ships is to remove the sick and wounded from the fighting vessels. The auxiliary hospital ships are intended for transport—the high sea hospital ship for continuous treatment. This does not mean that the high sea hospital ship should not be used as a transport if need be. In order that combatant vessels during the transfer of wounded shall receive more protection against submarines it is advisable to make this transfer near shore.

"The next duty after the care of the wounded is the rescue of the shipwrecked. Another type of hospital ship is believed to be desirable for this purpose—the 'rescue ship.' These are small, easily handled ships with low freeboard to facilitate taking the shipwrecked on board. During the war although many such vessels were available they were not fitted out.

"In selecting vessels for high seas hospital ships, the larger are to be preferred as the sanitary features are better and the weather conditions do not greatly influence them. A net registry of 6,000–9,000 tons with space for 300–450 beds and speed of 14–16 knots are preferable. Desirable features for a hospital ship are sanitary equipment, roominess, high decks, smooth walls of good color, abundant natural lighting of the lower decks, sufficient electrical illumination, steam heating, ice machines and refrigerating rooms, distilling apparatus, artificial ventilation, and a Clayton disinfector. The vessel should have an easy motion in a heavy sea. New vessels are better than old. The Hague conference names only 'hospital ships' and comprises under this designation all vessels used to bring relief to the wounded, sick, and shipwrecked. The auxiliary hospital ships are smaller crafts from 500–1,000 tons net registry, with good seagoing qualities, ability to manoeuver, and sufficient room for 50–80 wounded. A small operating room, a mortuary, and isolation ward are desirable. Quick preparation of food and hot drinks and a supply of clothing for the shipwrecked should be provided; also a complete rescue outfit. The British used the largest ships for auxiliary hospital ships, as they did not serve the fleet but brought home a large number of wounded soldiers from the front. Because of their ignorance concerning the small auxiliary hospital ships and equipment

Digitized by Google Original from UNIVERSITY OF MICHIGAN

necessary an adverse decision was rendered against the *Ophelia* after her seizure.

"The estimate by Blackwell of 20–30 per cent of wounded after a major action is considered by Zur Verth as much too high. Only the smaller German ships, exceptionally reached these figures. On a larger vessel 5 per cent is rare. Provision for 5–10 per cent is enough with emergency beds if necessary. Plans for converting each selected ship should be prepared in peace times and the place assigned for outfitting with selected equipment, even to the last medicine bottle. Provisions should be made for the needed personnel and material which should be on hand awaiting use. The cost of conversion of a high-seas hospital ship was about 80,000 marks. The U. S. S. hospital ship *Relief* in 1895 was converted in four weeks, according to Senn, who thought it a remarkably short time. The cost was about 630,000 marks. In preparation for war in 1899, the Japanese Red Cross built two ships for the merchant trade in view of using them as hospital ships. During the Chinese trouble of 1901 and in the Russian War they rendered good service.

"The removal of the sick and wounded at sea was by the small auxiliary hospital ship, which came alongside, or by boats. On the main deck was usually a side door through which, in quiet water, the sick and wounded could be transferred across a strong gang plank, but the hoisting cranes were generally used for this purpose. A special outfit of life-saving aparatus was furnished each vessel. On board there were in addition to the launches and boats, folding boats, and canvas boats with folding sides, life-saving floats, and rescue baskets, like large bird cages, made of canvas and rope ladders. The floats were fitted with lines for those to cling to who could not climb on board and each had two oars and night light. In a tin or sheet metal box attached, were kept "hard tack," infusion of tea, signal pistol with 20 cartridges, and two signal whistles. This box had a screw top to render it water-tight, and could only be opened when a lead seal was broken or cut. The rescue boats of the hospital ship also carried a special case containing food, medical supplies, and night signals. A life-saving rope with loops was hung about the ship and Jacob's ladders weighted at the end were placed at intervals. Slings were kept ready in which drowning persons could be made fast, and "rescue hooks" provided for use at gangways and in boats. On the rail of the promenade deck were hung many ring life buoys easy to get at and loose. Half should be fitted with water lights for night use. Every fourth buoy had a 90-foot line. A large number of "swimming vests" were kept near the beds of the sick and in the boats.

"In the conference concerning the application of the Geneva Convention to naval warfare, binding decisions were not made as to

Digitized by Google Original from UNIVERSITY OF MICHIGAN

whether line officers may be employed on hospital ships. Nevertheless international practice has so taken form that no objection is made to the embarkation of a military crew. On the other hand the presence of line officers is regarded as endangering neutrality.

"In the Japanese Navy during the early part of the war with Russia, line officers were put in command of hospital ships. Later, however, they were replaced by medical officers to avoid every suspicion of violation of neutrality. In most countries, and also in Germany, part of the crew of the hospital ship is from the naval military force for the hospital service, signaling, and boats crews for rescue work, and part from the merchant marine for the care and navigation of the ship. *Actual, active, and fundamentally military officers are not allowed on German hospital ships.* On board the German hospital ship, therefore, the medical officer was always in command.

"The ship's company, the personnel of the firm from which the ship was taken over, occupied the same quarters allotted to them in times of peace. There was one hospital corpsman for every 8–9 beds whereas on an American hospital ship there is one hospital corpsman for every 4 beds. As to women nurses on board hospital ships prejudice against them is without foundation. Whoever has had experience will know what an elevating, encouraging influence they have, besides adding neatness, skilled nursing, and comfort for the patient. On the auxiliary hospital ship conditions are not so favorable for women nurses.

"For the transfer of wounded at sea by the hospital ship's crane, a special apparatus called the 'double litter' was found very useful. This consists of a wooden frame, 2 meters long and 1 meter wide, inside measure, from which is suspended a canvas carrier to hold two persons. The patient is kept in his 'transport hammock' when placed in the double litter and secured by canvas sheeting so that he can not fall out when the carrier is lifted by the crane. Two stay lines give safe guidance while raising. This method has a great advantage over ladders or gangplanks on a rolling vessel. The shock of bringing the carrier to the deck can be lessened by hammock mattresses. After the battle of Skagerrack, June 1, the *Sierra Ventana* in one hour removed 41 wounded and 16 dead from the auxiliary ship *Kerwisler*, about one every minute from the time the ship came alongside. Ships suitable for conversion to hospital ships usually have cargo hatches, so that patients can be lowered through the hatchway to the wards.

"The employment of the hospital ship will vary according to the way the war is conducted. The ship may be kept on the home coast to bring help to those injured by mines or torpedoes, or it may accompany a squadron to an advanced base; it may be employed as

Digitized by Google Original from UNIVERSITY OF MICHIGAN

a transport for wounded to the home-base hospitals, or it may serve as a mobile floating hospital. The theatre of battle is rarely on the high seas; usually it is near a place of support [base] where the hospital ship can remain during action. After the battle of Skagerrack by far the largest number of wounded were put ashore directly from the warship at home ports. During the battle of Tsushima the Japanese hospital ships were on the Chinese coast and not at hand to help. The auxiliary hospital ship is the proper type for a coastwise war and should be stationed near the route of communications. The 'high-sea' hospital ship is of greatest service for distant expeditions. Mines are the chief danger for hospital ships, therefore the merchant ship selected for conversion should have many bulkhead compartments. A very high superstructure and boat deck should be avoided, as they render the ship hard to handle and make it difficult to take on and put off boats for rescue work. The ideal hospital ship is one that is built for the purpose and the nearer a merchant ship approaches it in structure the more suitable it will be."

MISCONDUCT RULING.

Several cases similar to the following, involving the question of misconduct, have recently required the decision of the department:

A man was discharged September 4, 1920, upon the expiration of his enlistment. His health record shows an entry on December 11, 1919, of an admission for syphilis, not in the line of duty, due to his own misconduct, for which he received treatment and in time returned to duty. As the disability originated subsequent to July 1, 1918, it is clear that his admission to the sick list would involve a checkage of pay.

Some time after his discharge this man reenlisted, and in the course of time he was admitted to the sick list with choroiditis, which was believed to be syphilitic in origin. The question of misconduct as applying in this case arose. The Attorney General and the Judge Advocate General have placed each enlistment in a separate category, and it would not seem in keeping with these decisions to make an act which was committed in one enlistment penalized in another.

The Judge Advocate General of the Navy gave as his opinion that the element of misconduct present during the first enlistment had been completely spent and that the proper entry should be "not in the line of duty, not due to his own misconduct." In the absence of any facts showing that his last admission to the sick list was directly due to his own misconduct he should be given the benefit of any doubt which might exist. The Judge Advocate is fur-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ther of the opinion that where the disability complained of, as in this case, is a separate and distinct disability from that which he was originally admitted to the sick list with a diagnosis "due to his own misconduct," it should not be held to be due to his own misconduct, although the board of survey is of the opinion that the latter disability is a sequel to the former disability.

Where an individual in the Naval Service has been found in a prior enlistment to be suffering from a disability resulting from his own misconduct, for which he received treatment resulting in his restoration to duty, this fact together with the further fact that he was subsequently found qualified for reenlistment in the naval service should, in the opinion of this office, preclude a subsequent finding of misconduct for the same disability, except in the case where it is shown to have been again incurred due to his own misconduct.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS.

NOTES ON DIETETICS TAKEN AT MISS FARMER'S SCHOOL OF COOKERY, BOSTON, MASS.[1]

Dietetics is a study of food and its relation to the body. The six essential food substances are:

(1) Carbohydrates: Composed of carbon, oxygen, and hydrogen. They furnish heat and energy to the body.

(2) Fats: Composed of carbon, oxygen, and nitrogen. They furnish heat and energy but have a greater food value and are much harder to digest than carbohydrates.

(3) Proteins: Composed of carbon, oxygen, nitrogen, hydrogen, and sulphur. They build and repair the tissue, and assist in growth and development of muscle and bone.

(4) Water: Composed of hydrogen and oxygen.

(5) Mineral salts: Help to regulate the body processes, maintaining alkalinity and acidity.

(6) Vitamins: Organisms found in food. They are essential to growth and normal living.

Foods rich in carbohydrates.—Flour, fruits, rice, cereals, corn meal, crackers, pastry, potatoes, beans, corn, macaroni, spaghetti, sirups, and all products made from sugar.

Foods rich in fat.—Butter, cream, cheese, oils (olive and cottonseed), soy bean, corn meal, cottonseed meal, flour, oatmeal, pork, bacon, and other fat meats, codfish, egg yolks, cocoa, chocolate, nuts, heavy cream.

Foods rich in protein.—Milk, egg whites, lean meats, fish, chicken, dried beans, and peas.

Food rich in minerals.—Potatoes, apples, bananas, carrots, cabbage, spinach, grapes, strawberries, lettuce.

Foods rich in vitamins.—The vitamins are divided into three classes on account of the substances in which they are soluble.

Fat soluble A: Butter, cream, milk, cheese, cod-liver oil, eggs, kidneys, cabbage, carrots, chard, lettuce, spinach, sweet potatoes.

Water soluble B: Whey, yeast, milk powder, nuts, cottonseed oil, bread, cabbage, carrots, oranges, lemons, grapefruit, tomatoes, bran and germ of whole grains, green vegetables.

[1] These notes were compiled by Miss Loretta Lambert, Navy Nurse Corps, while attending the dietetic course at Miss Farmer's School of Cookery, from April 1, 1923, to June 30, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Water soluble C: Oranges, lemons, tomatoes, grapefruit, apples, spinach, lettuce, raw cabbage, fresh peas, onions, carrots, cauliflower, traces in potatoes and cold milk.

CALORIES.

A calorie is the amount of heat it takes to raise the temperature of 1 gram of water 1° C.

The "bomb calorimeter" is used to measure the amount of heat or number of calories each food is capable of producing when burned outside the body.

The "respiratory calorimeter" is used to measure heat or calories produced inside the body.

The amount of calories required depends upon the physical condition, age, sex, size, and work of the individual.

A patient at rest requires 25 calories per kilogram (1 kilogram is equal to 2.2 pounds).

Doctor Joslin, of the Deaconess Hospital, Boston, in telling his patients about calories, states that each time we rise from a chair, turn a key in the door, and sit down, a calorie of body heat is used.

The food required for an average individual doing a moderate amount of exercise is from 2,500 to 3,000 calories.

The following table may be used to estimate the number of calories needed:

	Calories per hour per pound body weight.
Sleeping	0.42
Sitting at rest	0.65
Light muscular exercise	1.10
Active muscular exercise	1.90
Severe muscular exercise	3.00

People reducing in weight should not lose more than 2 pounds per week.

The following is a list of 100 calorie portions:—

2 slices bacon.	2 tablespoonfuls heavy cream.
¼ cup macaroni.	1 tablespoonful butter.
1 shredded wheat.	2½ ounces corn meal.
¼ cup flour.	2 thin slices bread.
⅓ cup milk.	1 medium-sized potato.
1 large orange.	3 Boston crackers.
4 small onions.	4 tablespoonfuls cornstarch.
⅓ pound carrots.	1½ inch cube cheese.

FOOD CHEMISTRY.

Cereals.—Cereals are high in carbohydrates. Starch is stored in the tissue of the plant as a reserve food for the plant itself. It is

Digitized by Google Original from UNIVERSITY OF MICHIGAN

formed by an enzyme in the plant. Carbohydrates of cereals are cellulose and the starch.

Rolled oats are oats put through a roller. Oatmeal is ground oats. The oats are dried to loosen the outside husk. Oats are a very good medium for yeast. Compressed yeast is made of the protein of the oats. Rice is a cereal used mostly in China and in the Tropics. Corn meal is an American foodstuff. It is scarcely known outside of this country; on account of its high fat content it becomes rancid quickly, therefore can not be shipped easily. White corn meal is not as rich in vitamines as yellow.

Flour is divided into four grades: (1) High-grade patent flour; (2) baker's or clear flour; (3) second patent; (4) regular dog (used for animals).

The two kinds of wheat used for flour are: (1) Spring wheat, high in protein and used for bread flour; (2) winter wheat, low in gluten and used for pastry flour. Gluten flour is used for diabetics. It is ordinary flour with the starch washed out.

Macaroni is made of hard wheat, called durum; it is 30 per cent gluten.

Meats.—Meat is the muscle tissue of the animal. It must be clean, sound, and properly dressed. Meat, flesh, and fowl, must be kept at a freezing temperature.

Pickled meats are made by immersing the meat in brine and dipping in a sirup.

Jerked or dried meat is a meat prepared by being cut in thin slices and dried, usually by the aid of the sun. Bacteria live in moisture, therefore if the meat is properly dried it will not spoil.

The preservation of meat by canning is done by canning, sealing, and subjecting to a high temperature.

Starch is often put in sausage to keep it fresher and plumper, but it must be marked thus.

Beef should stand for three weeks after being killed, before using.

Lard is made out of the fat which comes off the flank of the swine.

Scoring meat is to cut the fascia so that the meat will roll for roasting, etc.

Corning is putting the beef in brine and letting it stand for four or five days. The brine should be heavy enough with salt to float a potato. When corn beef is too old, it is hard, red, and dry.

Larding is to put salt pork with the meat while it is roasting or cooking, to flavor it.

Flank steak is off the hind quarter and runs lengthwise. Skirt steak is off the fore quarter.

The rump of the loin of beef is the best part and is used for steaks and roasts. Rump tenderloin is very tender, but not very nourishing.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Sirloin steak or sirloin tenderloin is a long strip, tapering at the end.

A porterhouse steak is composed of a tenderloin and a sirloin. It is very expensive.

The face of the rump makes a good roast. The back of the rump is more choice and more expensive.

Brisket is off the fore quarter and makes very good meat for boiling. It is also good corned.

Shoulder can be used for steaks. The neck is used for mincemeat.

Fish.—Fish resembles meat in the microscopical examination. It contains more water and gelatin than meat.

Cod is a very good fish, but superior only to haddock when boiled. The cod has a white line down its back.

Halibut is a white, dry fish and is more expensive than cod or haddock.

Haddock is better than cod in that it can be prepared in more ways. It has a black line down the back and has marks similar to thumb prints on either side of this black line.

Flounder is a member of the halibut family, but is not so white. It shrinks considerably when cooking.

Fillet of sole is very rare and hard to get. Fillet of flounder is often sold to unsuspecting persons.

Black salt-water bass is a very rare fish. It is expensive and the securing of it very uncertain.

Striped bass has yellowish and red stripes running along the back.

Strawberry bass has stripes running crosswise.

Bluefish is an expensive fish and hard to secure.

Panfish is a fish small enough to fry in a pan.

Shad is getting scarcer every year. They are found in Florida and all along the Atlantic coast during the warmer months.

The roe shad is the female shad. The roe is millions of small eggs, some of which mature.

The jack shad is better tasting than the roe shad, as a good deal of the strength is given into the offspring in the female shad.

Mackerel can not be secured when the weather is cold, as they will not run in cold water.

Salmon is a very expensive fish when fresh. The Penobscot salmon is very good.

Lobster: The female has a deposit of coral in the under part which is edible. The female lobster is better tasting than the male.

How to determine if lobster is good: The tail of a cooked lobster should be stiff and springy; if the tail is limp it has not been cooked while alive. If the meat is in small pieces and is watery or milky it is not good. The meat should be white and firm. If it has an odor of ammonia it is not good.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Scrod: This is not the name of a fish, but is the manner in which the fish is prepared. It is generally cod or halibut.

Trout: May be cultivated and is very expensive. Genuine brook trout can not be sold in public markets.

Swordfish is a solid fish and does not shrink when cooked. They can be obtained only in the warm season.

Finnan haddie is haddock soaked in salt water from 6 to 12 minutes and hung on a rack, then smoked.

Milk.—Milk is one of the few foods which includes in its composition all the foodstuffs, therefore it is a valuable food in the invalid dietary. It should be kept in a temperature of 50° F. Adults should drink 1 pint of milk a day and children 1 quart.

Cream for coffee and cereals should be at least 20 per cent fat; for whipping, 40 per cent fat.

Pasteurized milk: The bottles are filled not quite to the top, then closed to prevent contamination ofter Pasteurization. The milk is heated to a temperature of 140°F. and held there for 30 minutes. The lactic acid bacteria are killed by Pasteurization.

Milk is graded thus: Certified, grade A, grade B, store milk or grade C, skim milk.

For certified milk, the cows must be tested for tuberculosis. The men working about the cows and handling the milk must be in perfect health, passing a physical examination.

For grade A milk, the milk must have 4 per cent butter fat, and be low in bacterial count.

Grade B milk is up to the legal standard in butter fat, but not so low in bacterial count.

Grade C milk is high in bacterial count.

In condensing milk, most of the water is removed. The sugar acts as a preservative and counteracts the acidity.

Malted milk is made by combining whole milk with the liquid separated from mashed ground barley and malt.

Eggs.—Eggs are collected and kept in a temperature of at least 44°F. When stored one year, they lose all their moisture, which is 10 per cent of their weight, and they then begin to decompose.

In January and February, we begin to get better eggs. They are the eggs collected in May. The eggs procured in June are the older eggs. Fresh western eggs are only 4 weeks old when shipped east.

Candling: Hold the egg to the light in a darkened room; if it shows up clear, it is fresh; if it is dark and cloudy looking, it is very stale or spoiled. Spoiled eggs are treated with formalin and shipped to tanners and used on hides.

Eggs are sometimes powdered and used for cooking. They still contain the vitamins and are much cheaper than fresh eggs. There are different methods of drying them; some are dried in the shell,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

some on rolls, and some by spraying. Most of the dried eggs come from China.

Phosphorous, which is next in importance to iron in minerals taken in the food, is found in egg yolks. Iron is also found in egg yolks.

DIETS FOR DISEASE.

Diabetic diets.—The latest treatment of diabetes is the use of the insulin, which eats up the carbohydrates taken in the food. Therefore, if a diabetic patient eats no carbohydrates when using insulin, he will have a reaction. A patient taking this treatment should have his meals from 20 to 30 minutes after he has had the drug. If he gets too much insulin, the blood sugar will drop below normal and this will also cause a reaction. It is a dangerous drug if the treatment is not given properly, therefore great care should be taken in the weighing of the foods and to serving it within the required time.

If the urine is sugar free, there is no danger of an acidosis. Overeating is bad for anyone and may cause diabetes. Between the ages of 60 and 70 years fat people are more liable to develop diabetes than thin people.

A patient on a diabetic diet should have 1 gram of protein to every kilogram of body weight.

The normal amount of food substances generally consumed by a person weighing 154 pounds is 400 grams of carbohydrates, 78 to 100 grams of protein, 75 grams of fat.

The above is the amount taken in 24 hours.

Omitting the sugar absolutely from the diet of a normal person will cause an acidosis.

A diabetic should not drink buttermilk, as it lacks the fat which is needed for nourishment, but still contains the sugar found in milk. Apples should not be eaten, as they contain a large amount of carbohydrate. One small apple contains about 1 tablespoonful of sugar and a large one about 4 tablespoonfuls.

Grapefruit is the best fruit for diabetics; strawberries rank second and oranges third.

Vegetables are arranged approximately according to their carbohydrate content. The card used by Doctor Joslin of the Deaconess Hospital, Boston, gives the list of vegetables ranging from 1 per cent to 20 per cent carbohydrate. This card may be procured from Thomas Groom Co., 105 State Street, Boston, Mass. On it are also found the test and maintenance diets used by Doctor Joslin with the insulin treatment.

Sippi diet (*treatment for peptic ulcer.*)—In cases of severe hemorrhage the patient is given no food for a few days.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

After the first three days the patient is fed every hour with equal parts milk and cream in amounts of 1 to 3 ounces. Half way between each feeding a powder consisting of 10 grains each of calcined magnesia and sodium bicarbonate is given, alternating with another powder containing 10 grains of bismuth and 20 to 30 grains of sodium bicarbonate. These powders, together with the hourly feedings, neutralize the free hydrochloric acid and allow the ulcer to heal.

After 10 days the patient may have soft cooked eggs and well-cooked cereals added to the diet. The bulk of each feeding should not be more than 6 ounces, and should be taken at equal intervals throughout the day. In the diet, cream soups, vegetable purees, or other soft foods may be sustituted, such as jellies, custards, and creams, keeping, however, the milk, cream, and eggs as the basis of the diet.

During the course of the treatment the patient should have not less than five feedings a day.

For a period of a year or more milk, cream, eggs, puree of vegetable, cereals, bread, butter, and light meats should form the basis of the diet.

In cases where milk is distasteful it can be flavored with tea, cocoa, grape juice, etc.

Nephritic diet.—Nephritis being a disease of the kidneys, great care should be taken to relieve the tax upon them by giving them the proper diet. The foods given should be low in protein and salt poor. It is impossible to give them a salt-free diet, as all foods contain some natural salt.

Some of the foods to be avoided are meat broths, strong tea or coffee, vinegar, alcoholic beverages, meats and foods high in mineral salts.

The following is a salt poor diet used for extreme cases of nephritis at the Presbyterian Hospital, New York city, N. Y.:

Breakfast:

30 grams bread.
10 grams sugar.
60 grams farina.
30 grams salt free butter.
1 egg (40 grams).
150 c. c. coffee.

Dinner:

30 grams bread.
20 grams butter.
10 grams sugar.
100 grams farina.
150 grams tea.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Supper:

1 egg (40 grams).
15 grams toast.
30 grams bread.
15 grams butter.
60 grams prunes.
100 grams custard.
180 grams c. c. tea.

The above diet gives 35 grams protein; 1 gram chlorides; 65 grams fat; and 140 grams carbohydrates, giving in all 1,300 calories.

Constipation diet.—Food low in fat content in proportion to its protein and carbohydrates may cause constipation. The constipation diet is composed of coarse vegetables, fresh fruits, coarse breads, such as bran and whole wheat. Bran cereals are very good. Drink lots of water and avoid fried foods. Meat should be broiled or roasted.

A practical menu for a patient on a constipation diet:

Breakfast:

Coffee (black).
Stewed fruit.
Bran cereal with milk.
Whole wheat bread (plain).
No eggs: occasionally crisp bacon.

Luncheon:

Glass milk or buttermilk.
Celery soup.
Lettuce salad.
Mushrooms, corn, peas, or tomatoes.
Baked apple or fig newtons or fresh gingerbread.
Avoid soups made with meat or meat stocks.

Dinner:

Any cream soup.
Small portion of beef, lamb or veal, chicken, fish steaks or chops. (No pork, duck, goose, or any salted or preserved meats or fish).
Two green vegetables may be given such as spinach or greens, onions, parsnips, squash, and lima beans.
One starchy vegetable.
Lettuce or vegetable salad with French dressing.
Bread (bran).
Coffee (black).
A glass of water with each meal.

For diarrhea.—Give easily digested food that will stay in the stomach a long time. Give no foods containing acids or they will cause irritation.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

For tuberculosis.—Give nourishing foods; this class of patients should be fed frequently. Milk and eggs should form the basis of this diet.

Below is a list of food for jaw cases and for people who have had teeth extracted. These foods are high in caloric value and easily taken:

Vegetable purees.
Scraped beef.
Coffee sponge.
Puree of prune.
Soft milk toast.
Boiled custard.
Orange albumins.
Ice cream.
Cream soups.
Cereals (diluted).
Baked potato with cream.
Chocolate or caramel eggnogs.
Mashed potato with meat gravy.
Broth with egg and cream.
Apple sauce and apple snow.
Cornstarch pudding.
Gingerale with cream (equal parts).

Below is a menu containing 2,481 calories taken from above:

Breakfast:
- Fruit juice, 33 calories.
- Oatmeal, 200 calories.
- Hot milk, 100 calories.
- Sugar, 50 calories.
- Slice bread, 50 calories.

10 a. m. Chocolate malted milk.

Luncheon:
- Cream soup with egg yolk, cream and rice, 175 calories.
- Mashed potato with gravy, 298 calories.
- Spinach with butter, 200 calories.
- Ice cream, 200 calories.

2 p. m. Gingerale with cream, 100 calories.

Supper:
- Milk toast, 400 calories.
- Apple sauce with custard, 350 calories.

MENU PLANNING.

It is very easy to get into a rut by following routine. There should be a variation from day to day, week to week, and more marked from season to season.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Do not have all starches at the same meal, such as rice or macaroni with potatoes.

Plan the meals so that part can be prepared on top of the stove and the rest in the oven. Have a simple salad with dinner and a heavier salad with a luncheon. Have vegetables of different color at the same meal. This makes trays, especially, look more attractive. For instance, do not have corn and parsnips at the same time, but tomatoes and corn or beets and parsnips.

With a fish dinner, boiled onions, beets, or turnips are very good. Avoid using canned fruit and vegetables when fresh ones are on the market. Serve food hot that is supposed to be hot, and cold that is supposed to be cold.

KITCHEN EQUIPMENT.

Things that are used every day should not be behind closed doors. Have the sink the height of the worker; if working at a low sink, put a block or inverted pan in the sink. Have best light near the stove and working table. The windows should be well screened in summer, and should be 42 to 46 inches from the floor. The space beneath the windows should be utilized. Have opposite windows for ventilation, also a door opposite a window. Have flues on all stoves to carry out the odors.

The floor covering should be nonporous, nonabsorbent, and easily cleaned linoleum. If using printed linoleum, have it shellacked once a year.

The refrigerator should be one that is easily cleaned, with no cracks. Be sure that the shelves come out and that there is a dead air space between the walls.

Be sure that the garbage is disposed of daily, at least, and that the garbage pail is cleaned properly.

Have first-class kitchen utensils. Buy knives of a good quality of steel. Cutlery that is seldom used may be of a cheaper quality. Do not buy complicated kitchen utensils as they are difficult to keep clean. Have round handles on stewpans; avoid handles with edges. Broad, shallow pans are better than high, small ones, as there is more surface exposed to the heat. Rubberoid handles are very nice on pans. Iron utensils are heavy and easily cleaned. They resist high temperature, and are suitable for baking and roasting. Sheet iron, thinner quality, is good for baking sheets, baking pans, etc.

Steel utensils resist high temperature, but they are not so easily cleaned. Tin does not endure high temperature. It discolors easily. If buying tin utensils, buy the best grade as it is cheaper in the end. Aluminum is light in weight and does not radiate heat quickly; it is easily cleaned. Acid foods affect it slightly, and it is seriously

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

affected by alkaline water. Have a lip on either side of the pan for pouring. Steel wool cleans aluminum nicely.

Earthenware is moderate in weight and endures moderately high temperature. It has a glassy impervious surface and is easily cleaned. It is suitable for slow baking, casseroles, etc.

Woodenware is used for chopping bowls, boards, spoons, mashers, etc. Pyrex ware is impervious to heat. Do not place pyrex on cold sink or marble when taking from the oven. Handle with moderate amount of care.

Gas burners should be given special care. Wash and boil them frequently with sal soda. Oil them if necessary.

EFFICIENCY PRINCIPLES.

There are 10 efficiency principles:

1. Formulation of an ideal.
2. Common sense.
3. Competent counsel.
4. Standardized conditions.
5. Standardized operations.
6. Despatching and scheduling.
7. Reliable records.
8. Discipline.
9. Fair deal.
10. Efficiency reward.

Formulation of ideals.—Write down on paper your ideal of a kitchen. Plan that food that should be hot is hot. Plan that food that should be cold is cold. Are conditions such that everyone is as comfortable as they should be while working in your department?

Do you think of three meals per day as building up the body or as merely satisfying the appetite? Principle always before precedence. The right ideal always puts the first thing first. Do your people like to work for you? Are you doing your work and are they doing theirs with as few steps as possible?

Competent counsel.—Be sure of your counsel. Have reliable books as reference in your work.

Standardization of conditions.—Is equipment so placed in your kitchen as to make work as pleasing as possible? Are the tables, shelves, and sinks the right height? Have you convenient hooks, hammer, nails, etc.?

Are the floors properly cared for?

Concentrate as many things as possible; draw in your line of travel. Try to eliminate too much walking. Have all equipment where it will be convenient to use.

Your aim should be that each equipment should be studied before being purchased.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Standardized conditions.—Study the habits, likes, and dislikes. Set a standard for the meals and stick to that standard.

Standardized operations.—Watch your people work and see if they are using more steps than necessary in doing their work. Work out the best method of doing things.

Fair deal.—Give the people and everyone, in fact, connected with your work a fair deal. If they are doing their work satisfactorily, let them know that you appreciate it.

REFERENCES.

Dietetics for Nurses, by Proudfit.
Miss Farmer's Book of Invalid Cookery.
Practical Dietetics, by Alida Frances Pattee.
Food Values and Economical Menus, by Alice Bradley.
Farmer's Bulletin No. 1228, United States Agricultural Department.
Mary Schwartz Rose's Book on Dietetics.

A class of nurses has just completed the course at Miss Farmer's School of Cookery, Boston, Mass. A brief outline of the work covered by the course follows:

Lessons in—
- Scientific measuring, preparing, and cooking of food.
- Menu planning, budgeting, household administration, and kitchen equipment.
- Serving food in an attractive manner.
- Meat cutting.
- Special diets.
- Canning and jelly making.
- Quantity cooking.

Visits to—
- Diet kitchens of several large hospitals.
- Carnegie Nutrition Laboratory.
- Baker's Chocolate Factory.
- Armour's Packing House.
- Forsythe Dental Infirmary.
- Burnett's Flavoring Extract Factory.
- Sunshine Biscuit Factory.

Lectures on—
- Food value.
- Food chemistry.
- Diabetes (by Doctor Joslin at the Deaconess Hospital, Boston).

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

INSTRUCTIONS ISSUED BY THE BUREAU OF MEDICINE AND SURGERY.

Circular letter. WEE: SS 129733(102).
Serial No. 292–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., October 23, 1923.

To: All naval hospitals.

Subject: Patients suffering with tuberculosis or neuro-psychiatric diseases and conditions who are veterans of the Spanish-American War, Boxer rebellion, and the Philippine insurrection, now under treatment but who are not beneficiaries of the Veterans' Bureau as veterans of the World War, and who are not at present members of the regular Military and Naval Establishments.

1. The Acting Medical Director of the Veterans' Bureau requests to be informed as to the number of patients now suffering from tuberculosis or neuro-psychiatric diseases and conditions who are now under treatment in the several naval hospitals and who are veterans of the Spanish-American War, Boxer rebellion, and the Philippine insurrection. It should be clearly understood that this number is not to include such men who are beneficiaries of the Veterans' Bureau as veterans of the World War, nor those who are now members of the regular Military and Naval Establishments.

2. It is further desired that the information be submitted to this bureau, in duplicate, classified by the number of tuberculosis cases and the number of neuro-psychiatric cases separately.

E. R. STITT.

Circular letter. P–32–42022.
Serial No. 293–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 29 October, 1923.

To: All medical officers, chief pharmacists, and pharmacists.

Subject: Hospital Corps Handbook, U. S. Navy, 1923—issue of.

1. An initial issue of this book shortly will be made by the United States Naval Medical Supply Depot, Brooklyn, N. Y., in accordance with instructions of the Bureau of Medicine and Surgery. Upon

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

receipt, each activity will take up on the necessary property and accounting records the number and value of this initial supply. Copies will not be issued to individuals except as noted in the following paragraphs, but will be treated in all respects as other nonexpendable property on charge to the activity.

2. The volumes will be placed in the library and may be issued as necessary, those drawing them from the library to be held responsible for their return. They are to be used as reference books in the instruction of hospital corpsmen; and while instruction shall not be limited to the subject matter contained in this book, the contents of the various chapters and sections shall form the basis of the continuous instruction of hospital corpsmen.

3. At the training schools one copy may be issued to each man on entrance, which shall be returned upon completion of the course of instruction.

4. The Bureau of Medicine and Surgery regrets that because of limitation of appropriations the issue of a copy to each individual in the medical department cannot be authorized. It is desired that as many as possible avail themselves of the opportunity of obtaining a personal copy afforded by the Government Printing Office. Those wishing individual copies may obtain them by application to the Superintendent of Documents, Government Printing Office, Washington, D. C., upon payment of the cost of printing ($1).

F. L. PLEADWELL, *Acting.*

Circular letter. SDS WHM–HCM 125262(112)-
Serial No. 294–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 19 November, 1923.

To: All medical officers.
All naval hospitals, ships, and stations.

Subject: Adoption of revised Nomenclature of Diseases and injuries, Medical Department, U. S. Navy.

Reference: Chapter No. 15, Changes number one (1), Manual of the Medical Department, U. S. Navy.

1. There is forwarded herewith changes number one (1), of the Manual of the Medical Department, U. S. Navy, containing in chapter 15 a revised Nomenclature of Diseases and Injuries, which will be used on and after January 1, 1924.

2. Attention is directed to the provisions of paragraph 2401(b).

3. Attention is further directed to the changes made in the use of key letters outlined in paragraph 2411.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

4. A nomenclature of titles to be used in reporting operations on Form N. M. S. P.—Report of Operations—has been adopted and will become effective January 1, 1924 (par. 2414).

5. It is directed that on January 1, 1924, one copy of the nomenclature now in use will be marked obsolete for current use and placed on file for reference purposes. All other copies will be destroyed.

6. Separate reprints of the nomenclature will be used at a later date.

E. R. STITT.

Circular letter. AWD MET 125470(121).
Serial No. 295–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 4 December, 1923.

To: All naval hospitals.

Subject: Classified expenditures and per diem cost in naval hospitals (continental), during the quarter ending September 30, 1923.

1. The naval hospital, Mare Island, has the highest average number of patients but a low discharge ratio which in a measure may be accountable for the high number of sick days. In regard to the overturn of patients, cognizance should be taken of the delay in securing approval of medical surveys to which the west coast hospitals are subject due to the distance from Washington. This, however, is in a measure met by the fact that the eastern hospitals have to deal with the Veterans' Bureau patients whose aliments are usually chronic. The League Island Hospital has the highest discharge ratio of Group I, showing an active service. In Group II, Washington has increased to such an extent in the average number of patients as to entitle it to membership in Group I, but due to the generally chronic or complicated nature of the disabilities treated there, the discharge ratio is low. Newport shows an increased activity. Annapolis has had a few patients but a very rapid overturn.

2. The average hospital ration cost was $0.7459, the fraction of a cent under last year's cost (0.75), which is considered creditable in that this quarter is the least active part of the year as regards admissions and also as there has been an undoubted rise in food costs. The average ration cost in Group I was $0.7082, showing a slight decline from the last fiscal year. The cost in Group II was $0.78, practically the same as the previous year. Group III advanced from $0.75 to nearly $0.77. The San Diego and League Island Hospitals showed a considerable rise in ration cost, while New York is the only one in Group I showing any noticeable decrease—$0.09. All Group II hospitals showed increased ration cost.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

3. The maintenance charge for all hospitals was $4.59; of Groups I and II, the more active hospitals, the cost was $3.14.

4. By the careful checking of the supplies received, precaution against waste and destruction of property, there should be a much greater reduction than has so far been accomplished.

E. R. STITT.

Circular letter. WMK:MFD 127574(121).
Serial No. 296–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., December 5, 1923.

To: All medical officers.
Subject: Paragraphs 1280 and 1281, Naval Courts and Boards, 1923.

1. A footnote, No. 20, under paragraph 1281 of Chapter XIX of Naval Courts and Boards, 1923, requires that the record of proceedings of a board of medical examiners shall be made up in duplicate and each copy shall be *signed* by *all* members and the recorder.

"The first copy shall be complete in every respect and shall be forwarded to the president of the naval examining board, except that in the case of medical officers of a marine examining board convened as a board of medical examiners the board shall transmit their report to the marine examining board. The second copy shall be complete, except as to papers prefixed and appended to the record, to which appropriate reference shall be made, and shall be forwarded to the office of the Judge Advocate General direct."

2. Footnote No. 18, under paragraph 1280 of the same chapter requires that "wherever the board in its finding uses a technical medical term it should put in parentheses immediately following the technical term the corresponding lay term, if there be one."

3. The office of the Judge Advocate of the Navy has orally called attention to the fact that in many instances medical officers serving on boards of medical examiners have failed to comply with the above requirements. In view of this fact, the bureau directs that all medical officers serving on boards of medical examiners convened for the purpose of conducting the physical examination of candidates for admission, and of officers due for promotion or considered for retirement by reason of physical disability, give careful consideration to these two requirements.

E. R. STITT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Circular Letter. JRP–JV 132691–0(122).
Serial No. 297–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., December 19, 1923.

To: Medical officers.

Subject: Epidemiological study of influenza, the common cold and other respiratory disorders, now being carried on by the U. S. Public Health Service. Request for cooperation by Medical Officers of the Navy.

1. The United States Public Health Service is making a study of the interepidemic phases of influenza, common colds, etc., and desires to collect reliable data covering the incidence and prevalence of these respiratory infections in a large number of family groups with the expectation that valuable information relating to the nature of such infections, communicability, prevalence, predisposing influences, and perhaps other epidemiological factors, will be obtained by statistical analysis of the data thus obtained.

2. The cooperation of medical officers of the Navy who are married and stationed in the United States is sought.

3. Family reports are now being received from officers of the Public Health Service and from faculty members of seven of the leading universities. Arrangements are being made to increase the number of reports from universities and to include families of medical officers of the Army stationed in the United States.

4. The Surgeon General of the Navy feels that these studies may prove of great value if carried out on a sufficiently large scale and hopes that medical officers will take an active interest in them and accurately furnish the desired information for their families. The data are to be used for statistical purposes only. Names are not to be used except for collecting the figures and all information will be treated as strictly confidential.

5. It is requested that one of the enclosed enrollment records (Form A) be filled in for every member of the family group, including domestic servants. These should be returned directly to the bureau of the United States Public Health Service in the franked envelope enclosed for that purpose.

6. Thereafter an epidemiological report blank to cover the entire family will be mailed to you twice each month for reporting the incidence of respiratory disorders as they have occurred. It is requested that this report (Form C) be filled in and returned promptly to report the nonoccurrence as well as the occurrence of respiratory disorders during the period covered by the report. The practice will be to prepare current statistics by half-month periods through-

88728—24——7

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

out the year. Each report will therefore cover either the first or the last half of the month.

7. Very little work will be required—a few minutes twice a month. Names and period covered by the report will be entered by the Bureau of the Public Health Service before sending the form to you, so, as a rule, it will only be necessary to make check marks in appropriate columns. A sample form is enclosed for your information. Copies for actually reporting will be forwarded from time to time after you have submitted enrollment records for the family.

8. The enclosed circular letter from the Surgeon General of the United States Public Health Service to officers of that service indicates the plan and purpose of the study.

E. R. STITT.

P. S.—*This data will be furnished by married officers only, on shore duty, within the United States, and under the conditions stated.*

Unnumbered bureau circular.

TREASURY DEPARTMENT
BUREAU OF THE PUBLIC HEALTH SERVICE
Washington, September 17, 1923.

To: Commissioned officers of the U. S. Public Health Service, acting assistant surgeons, and others concerned:

Subject: Influenza, the common cold, and other respiratory disorders.

1. The United States Public Health Service has undertaken an intensive study of the interepidemic phases of influenza, the so-called common cold, and other respiratory disorders, with the desire of gathering data which will, in a measure, indicate the frequency, periodicity, symptoms, incidence, distribution, and spread of the above-mentioned diseases, and to study the connection which the common cold bears to influenza in its interepidemic stage.

2. To accomplish this study it is necessary to gather enough histories of respiratory disorders, every two weeks, to make these morbidity statistics valuable. Contact has already been made with several of the largest universities of the country, and through the assistance of the medical departments of these universities bimonthly reports will be received from as many students as possible on approved forms submitted by the service.

3. It is also desired to extend these studies to family groups in order that a wider age and sex distribution may be obtained and the contagiousness of the respiratory diseases observed. It is believed that if every officer of the service will submit the data as requested, a valuable service would be rendered. With this in mind and anticipating your willingness to cooperate in this work, there is inclosed with this circular a number of forms known as an enroll-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ment record or Form A. It is requested that one of these forms be filled in for each member of your household, including servants, and submitted to The Surgeon General, United States Public Health Service, Room 1–129, "C" Building, 16 Seventh Street, S. W., Washington, D. C. You are requested to return all enrollment records which you do not need. If additional forms are needed, they will be supplied upon request.

4. Upon the receipt of this enrollment record, there will be sent to you every two weeks Form "C" or cinical report, on which you will be requested to record any respiratory illness which may have occurred in your family during the period covered by the report. In the event no illness has occurred that should also be recorded in the proper place. These periods for recording will cover from the 1st to the 15th and from the 16th to the end of each month. They will extend over a length of time commensurate with a fair study.

5. The success of this work depends upon the willingness of the individual to assist in this undertaking. The amount of time requested for the filling out and mailing of these forms is a matter of only a few minutes every two weeks, and it is anticipated that each officer of the service will comply with this request.

H. S. CUMMING, *Surgeon General.*

Circular Letter. WSD 124942–0(124).
Serial No. 298–1923.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., December 28, 1923.

To: All naval hospitals (continental limits and Pearl Harbor).
Naval Medical School, Washington, D. C.
Naval dispensary, Navy Department.
Post surgeon, Marine Barracks, Quantico, Va.
Senior medical officer, Naval Training Station, Hampton Roads, Va.
Naval medical supply depots, Brooklyn and Mare Island.

Subject: Schedule of wages for civilian employees, effective January 1, 1924.

1. So far as relates to employees under the Medical Department, the new schedule affects only those in the following ratings:

Helper (Norfolk only).
Chauffeur.
Electrician.
Pipefitter.
Plumber.
Sheet metal worker.
Policeman.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The pay of other ratings remains unchanged.

2. Referring to paragraph 25 of the general notes at the end of the schedule, it will be observed that the pay of chief mechanics in all cases will be based on the pay for the rating of machinist, disregarding previous trade or occupation. The pay of other supervisory employees continues to be based on the trade from which they were promoted.

3. The entrance rate for clerical employees under classification D has been reduced to $3.60 per diem, or $93.60 per month.

4. In connection with paragraphs 8 and 52, relating to extra pay for night work and for mechanics in charge of power-house watch, attention is called to paragraph 5 of the general notes, providing that "no allowance in addition to the schedule rate of pay shall be paid employees on a per annum or per month basis."

5. Attention is called to the change in the rating of janitor from Group I (unclassified) to Group II (classified). This change was made in the "Regulations governing the employment of civil personnel under the naval service, and administrative regulations in connection therewith promulgated by the Secretary of the Navy," issued by the Civil Service Commission and effective as of September 15, 1923. These regulations provide:

"No employee holding an unclassified position under Group I when such position is included in one of the classified groups shall be classified unless he has established his capacity for efficient service and is recommended for such classification by the commanding officer and approved by the Navy Department and the commission: provided, that he shall not be promoted or transferred to any other designation except through an examination in accordance with the regulations."

Unless action already has been taken, inquiry will be made of the labor board as to the procedure required to obtain classification of janitors now employed.

6. Requests will be submitted for such changes in allotments as may be necessitated by the new schedule.

E. R. Stitt.

Circular letter. SB/MFB 115738.
Serial No. 299–1923.

Department of the Navy,
Bureau of Medicine and Surgery,
Washington, D. C., December 29, 1923.

To: All Naval Hospitals.

Subject: Laboratory courses for nurses of the U. S. Navy.

1. Hereafter courses in laboratory technique at the Naval Medical School will be given only to nurses, United States Navy, who have

Digitized by Google Original from UNIVERSITY OF MICHIGAN

had a preliminary course in the laboratories of the naval hospitals. This training shall be of not less duration than six weeks, during which time the applicant shall be under observation by the commanding officer and officer in charge of the laboratory to determine whether the preliminary training, personal inclination and native ability of the applicants are sufficient to warrant further study at the Naval Medical School.

2. Nurses should be urged to study diligently, so that they may be fully prepared to take the advanced work at the Medical School. It is directed that the same laboratory books as those used in the Naval Medical School be used for this preliminary period. Upon completion of this preliminary course they shall be required to pass a written examination, and their marks with a full report as to their qualifications shown for this work shall be forwarded to the bureau. It is directed that accompanying this report shall be a frank opinion as to whether they have sufficient ability to impart their knowledge to others, this being a vital necessity in the teaching of nurses and corpsmen, when they are finally placed on duty in a naval hospital laboratory.

3. Commanding officers are further urged to find and encourage nurses who are especially qualified to take up the different specialties and provide the bureau with this information.

4. It must be thoroughly understood that the nurses who are given courses in specialties will be required to fulfill their obligation to the service by remaining for such length of time as is considered reasonable by the department.

E. R. STITT.

Circular letter.
Serial No. 300–1924.

WEE: SS PQ&MR 124957(11).

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY.
Washington, D. C., January 3, 1924.

To: Recruiting medical officers.
Via: Officer in charge, U. S. Navy and Marine Corps recruiting stations.
Subject: Enlistment of men not physically qualified.

1. At the request of the Bureau of Navigation, this bureau desires to direct attention to the great monetary losses of the Bureau of Navigation in connection with the enlistment of physically disqualified men and also to the unnecessary hospitalization and other activities in connection with the disposition of these men. For some months both bureaus have been studying the question of the rejection or disposition after enlistment of those men who have been

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

found unfit, inapt, undesirable, or physically disqualified for the service, and the solution of the situation would appear to rest in a large measure, if not solely, with the recruiting officers, both line and medical.

2. This bureau has noted that many men have been accepted at recruiting stations who present physical defects which should have caused their disqualification and their rejection at the time of enlistment had the physical examinations been carried out conscientiously and carefully by the medical officer in person and verified by the officer in charge of the recruiting station. The bureau has also noted, however, that some men have been of necessity discharged by reason of defects or conditions which might have been overlooked by the medical officer at the recruiting stations owing to the oftentimes unfavorable conditions under which medical examinations in recruiting stations must be conducted, as well as due to the fact that certain defects appear only after a prolonged study of the individual case.

3. This bureau was in the practice of bringing to the attention of medical officers at recruiting stations all cases rejected by reason of physical defects which were discovered at the training stations and reviewed in hospitals by an adequate study of the case and definite conclusions arrived at as to the fitness of the individual for service. Although these cases were reviewed and the defects established at the hospital, yet the recruiting medical officers would dispute the findings and the bureau had reason to believe that the recruiting officers were in error; this, with full realization of the difficulty experienced by recruiting officers in obtaining recruits.

4. Attention of officers in charge and medical officers is directed to paragraphs 1452, 1453, and 1464(2) of the Manual for the Medical Department. The bureau believes that if the provisions of these paragraphs are strictly adhered to and that no person is accepted except after a careful physical examination by the medical officer personally and not by others and that if officers in charge will take sufficient pains to assure themselves that no physical defect exists, the enlistment of the physically not qualified individual can be avoided. Many cases have come to the attention of this bureau with the physical defects of such magnitude that the bureau can not reconcile the presence of the defects with a careful physical examination by a medical officer as the physical defect has been so apparent as to permit of no excuse for its being overlooked. These circumstances lead the bureau to believe that the physical examinations are not being conducted at some recruiting stations with sufficient care and attention.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

5. The bureau therefore directs that scrupulous pains be taken in conducting the physical examinations and that applicants be not accepted who do not meet the physical qualifications presented in the Manual for the Medical Department.

E. R. STITT.

Circular letter. JRP–LMT SD 126413(112).
Serial No. 301–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington D. C., January 5, 1924.

To: All medical officers.
Subject: Administration of triple antityphoid vaccine.

1. In consequence of occasional reports referring to severe reactions following the administration of triple vaccine containing typhoid and paratyphoid bacilli, a board consisting of commander C. S. Butler, Medical Corps, United States Navy, representing the Navy, Surg. G. W. McCoy, Director of the Hygienic Laboratory, representing the United States Public Health Service, and Maj. H. J. Nichols, representing the Army, was formed to consider the matter.

2. The board made a thorough study of this subject and of the evidence relating to severe reactions and reported that there is no good reason to justify any change in the present procedure and practice as to the administration of typhoid-paratyphoid prophylaxis. The occurrence of a certain degree of reaction after inoculation, greater in some cases than in others, seems to be a part of the process of establishing adequate immunization.

3. It was found that vaccine made in the spring and summer of 1923 was considerably overstrength. This was due to a gradual increase in the turbidity of the standards used for comparison in making the tests for turbidity upon which the standardization of the vaccine is based. In the future all lots will be standardized by actual count of the bacteria.

4. The batch of vaccine recalled by Alnav 32 of October 27, 1923 (lots 276D 1 and 2), was not a source of danger, as the contaminating organism was found to be a harmless aerobic spore-bearer.

5. The bureau does not contemplate making any change in existing instructions governing the administration of triple (typhoid and paratyphoid) vaccine.

E. R. STITT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Circular letter. AWD/JBC 125470(121).
Serial No. 302–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 12 January, 1924.

To: All naval hospitals.

Subject: Classified expenditures and per diem cost in naval hospitals (continental) during October, 1923.

1. As compared with the combined reports of July, August, and September, the October returns show an increased rapidity in the overturn of patients, 3.49 per cent as against 3.37 per cent, this higher rate being most noticeable in Groups II and III.

2. The daily average number of patients fell in Group I, with the exception of San Diego and League Island. Groups II and III remain about as during the preceding three months.

3. The average cost for per diem maintenance of all continental hospitals has risen from 4.59 to 4.65, Groups I and II combined show the per diem expense of these hospitals to have risen from 3.14 to 3.27, which would indicate that the increased cost of the patient day occurs in the larger hospitals. The following hospitals show a reduction in per diem cost; San Diego, Norfolk, Washington, Annapolis, Parris Island, Charleston, and Key West. Generally the fluctuation has been inversely to the patient activity but exceptions to this are Norfolk (lessened daily average of patients with marked lowered per diem rate), Charleston (unchanged daily average lowered per diem expense), Key West (lowered daily average decreased per diem costs). In comparing the various internal activities of the hospitals, it is evident that there is quite a uniformity in most activities, the greatest variability being in the cost of laundry, heat, power, and light, and maintenance of buildings and grounds (which, to a great extent, are not subject to administrative control), in transportation, administration, and in the commissary service. The last three are, in a large measure, controllable, as is heat, power, and light when furnished from the institution's own power plant. The cost of administration is noticeably increased in those hospitals having beds assigned to the Veterans' Bureau.

4. The San Diego Hospital report shows a general lowering of all per diem costs, especially those under heat, light, and power, and an increase in the commissary costs. Norfolk exhibits a decrease in the cost of administration, transportation, maintenance, buildings, and grounds but principally in that of ration. Chelsea shows a slightly higher ration cost and a considerable rise in administration, dispensary service, heat, light, and power, buildings and grounds, and in the commissary. It is noted that the total commissary charges

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

for the month of October are much in excess of those of September, while during the latter month the daily average of patients was considerably higher than that of October. New York shows a higher per diem patient rate in the X-ray department and in buildings and grounds and commissary. The ration increased 3 cents. The increase in the Mare Island per diem rate is apparently due to the higher laundry costs, heat, light, and power, and to the commissary, there being a general increased cost in all departments and no reductions. League Island exhibits a great increase in the cost of ration and a slight rise in ward maintenance, laundry, heat, light, and power, and transportation. In the case of Great Lakes, the most marked increase was in transportation and heat, light, and power, with a slight rise in the cost of ration. In Group II, Puget Sound shows a marked decrease in the daily per diem cost. Washington has cut the per diem cost 82 cents in spite of an increased value of ration, amounting to 3 cents. Newport still compares unfavorably with a similar hospital of about equal activity (Puget Sound). In Group III, Parris Island has a most marked reduction in per diem cost from 3.72 to 2.32.

5. The above brief analyses are made in order to bring to attention of those concerned possible avenues of legitimate retrenchment. It is felt that closer attention to the principal sources of expenditures should result in a lower per diem cost in most, if not all, naval hospitals.

E. R. STITT.

Circular letter. WHM–HCM 124842(13).
Serial No. 303–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 16 January, 1924.

To: All medical officers.

Subject: Form F cards in cases of patients taken up as from change of diagnosis.

Reference: (*a*) Instructions for numbered lines on back of Form F card duplicate, line 4.

1. The present practice in preparing Form F cards in the cases of patients who are taken up as from change of diagnosis is to leave blank line 4 (" patients received from ") on Form F card. Because of this, much time is consumed in the bureau in checking such cards with the previous cards.

2. In order to eliminate this difficulty, it is directed that in the future in all cases taken up as from change of diagnosis, an entry

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

will be made on line 4 of the Form F card to that effect, together with the reason therefor, e. g.:

"C"—Establishment of diagnosis.
"C"—Intercurrent disease.
"C"—Intercurrent injury.
"C"—Error in diagnosis.
"C"—Complication.
"C"—Concurrent disease.

3. Reference (*a*) will be considered as modified to agree with the above until revision of Form F card is effected.

E. R. STITT.

Circular Letter. WHM–HCM 129699(13).
Serial No. 304–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 16 January, 1924.

To The commanding officer, all receiving ships, Navy and Marine Corps recruiting stations, and Marine recruit depots.
Subject: Form "X"—Abstract of enlistments.
Reference: (*a*) Manual of the Medical Department, United States Navy, 1922, paragraph 3434.

1. It is directed that beginning January 1, 1924, Form "X" shall be prepared and forwarded on the first day of each month for the preceding month from all receiving ships, Navy and Marine Corps recruiting stations and Marine recruit depots, instead of quarterly as required by subparagraph (*a*) of reference.

2. First report will be rendered February 1, 1924, covering the month of January.

E. R. STITT.

Circular Letter. WHM–HCM SDS125262(14).
Serial No. 305–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 23 January, 1924.

To: All medical officers.
Subject: Addition of diagnostic title number 1973, "Urticaria," to Navy Nomenclature of Diseases and Injuries.
Reference: (*a*) Chapter 15, Manual of the Medical Department, 1922.

1. Pending the issuance of Changes No. 2 of the Manual of the Medical Department, United States Navy, it is directed that the title "Urticaria" be entered in paragraph 2421 under Class XIX on

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

page 245 of reference, following the title "Ulcer, skin. State location."

2. Under paragraph 2431, page 264(3) of reference, and following diagnosis number 747, "Urethritis (nonvenereal). State whether acute or chronic. Class VIII," enter the following:

1973 Urticaria ---------- XIX

E. R. STITT.

Circular Letter. WRJ:ML 132679(14).
Serial No. 306–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 23 January, 1924.

To: All medical officers.
Subject: Care in handling concentrated spirit of nitrous ether.

1. It has been brought to the attention of the bureau that several accidents have been caused by the bursting of the glass tubes used as containers for concentrated spirit of nitrous ether. From the facts presented it would seem that with proper precautions accidents can be avoided.

2. Containers now issued are protected by a mesh covering that will prevent the scattering of glass particles should the tube burst.

3. Contrary to the general impression, these containers do not explode violently but are simply burst by the pressure generated by the vapor of the highly volatile substance contained and no damage is caused if the container is wrapped to confine the glass.

4. In order that every safeguard be observed when opening tubes of concentrated spirit of nitrous ether it is directed that the following steps be carried out:

(1) Do not attempt to file tip of tube.

(2) Always keep ends of tube pointing away from you.

(3) Cool tube thoroughly.

(4) Without removing protection covering, wrap entire tube, with the exception of the tip, in a towel.

(5) Hold the wrapped tube in a vertical position, tip pointing down, and immerse tip well under the surface of the alcohol contained in a mortar.

(6) Crush the tip, under alcohol, with a pair of pliers.

(7) Filter to remove glass.

(8) The tips of mesh-covered tubes should be crushed without removing mesh from tip.

E. R. STITT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Circular letter. ELW:WMK:ESK 132586(21)
Serial No. 307–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., February 1, 1924.

To: All medical officers.
Subject: Equalization bill.

The proposed equalization bill provides:

1. For selection of a staff officer for promotion immediately after his running mate in the line, or when an officer in the line junior to that running mate, is selected for promotion.

The same percentage of staff officers will be selected as were selected in the line, i. e., if out of 100 line officers, 60 were selected and there were 10 medical officers who had running mates in that group of line officers, then 6 medical officers would be selected for promotion and each would be promoted on the date on which his running mate made his number.

2. Selection only applies to the ranks above lieutenant commander. The present law which promotes staff officers with their running mates to the rank of lieutenant commander remains unchanged.

3. The average age of graduation from the Naval Academy is 22 years and the age for retirement of a lieutenant commander of the line, if not promoted, is 45 years. The average length of service for line officers, under these circumstances, is 23 years. A medical officer on the date of his entry into the service must have as his running mate the junior lieutenant (j. g.) in the line who has 3 or more years' service to his credit. The latest date when this medical officer will be eligible for selection to commander can be determined by adding 20 years to the date of his entry into the service.

4. Age-in-grade retirement in the staff corps provides for the wide variance in the age at which staff officers enter the service, by requiring (*a*) a definite period of commissioned service in the staff corps, (*b*) failure of selection by two successive boards.

For example: A lieutenant commander must be 45 years of age, have had 23 years' commissioned service in his corps, and have failed of selection twice; a commander must be 50, have had 28 years' service, and have failed of selection twice; a captain must be 56, have had 34 years' service, and have failed of selection twice before being retired for age in grade.

5. For those staff officers who entered the service under the act of June 4, 1920, 10 years' service in the rank of lieutenant commander, 6 years' service in the rank of commander and 8 years' service in the rank of captain, respectively, is required before retirement for age in grade.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

6. Nothing in this bill affects the law authorizing retirement after 30 years' service or retirement for age when 64 years old.

E. R. STITT.

Circular letter. WRJ-Dy 125884(21).
Serial No. 308–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., February 4, 1924.

To: U. S. naval hospitals (continental limits).
Subject: Modification of present allotment system.

1. When the allotment system was promulgated an attempt was made to combine two separate and distinct features, i. e., appropriational and cost accounting. It was found after less than one year's trial that it was impracticable to continue the combination, so a separate cost accounting system was placed in operation to provide for this feature of hospital accounting. After a trial of six months this system has proved adequate for the purpose for which it was devised. It is now possible to modify the allotment system so as to include only the appropriational feature.

2. The major changes contemplated are:

(*a*) Preparation of a budget.
(*b*) Submission of reports quarterly, instead of monthly.
(*c*) Simplified classification.
(*d*) Consolidation of allotments.
(*e*) Making available obligated balances until expended.

Preparation of a budget.—Each hospital will prepare an estimate of all expenditures contemplated during the entire year. The estimate will include not only the usual amounts requested on annual requisitions and annual allotments but totals that will be required for the proper maintenance and operation of the hospital throughout the year. It is the purpose of the bureau to compile the estimates when received and make consolidated allotments to each activity covering the entire amount that may be allowed, or that may be possible to allow under the reduced appropriations available. Allotments made in this manner will permit commanding officers, as the total amount available is known in advance, to so plan expenditures as will best serve the interests of the hospital. Requisitions and job orders submitted throughout the year would be a charge to the amount allotted at the beginning of the year.

Submission of reports quarterly.—Report of expenditure cards will be submitted at the end of each quarter instead of monthly. This will decrease the amount of paper work about 75 per cent.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Simplified classification—Consolidation of allotments.—The present classification will be changed so that there will be five major objects of expenditure, i. e., "Supplies and services"; "Repairs and minor improvements"; "Sundry items"; "Equipment"; and "Structures and major improvements." The subdivisions under each major object, except where different appropriations are involved, may be included under one allotment card and as the amount is allotted as a lump sum will be available for any purpose under that classification. For example, the allotments covering all objects under "Supplies and services," will be one for civil employees, under the appropriation "Medical Department"; one for dental supplies, under "Contingent"; another covering stationery and office supplies, forage and other supplies for animals, and transportation service, under "Contingent"; and one for provisions and another for all other supplies and services, under "Hospital fund." Thus, five allotment cards will cover all this type of supplies and services for the entire year in place of 50 or more as is the case under the present system. The same conditions would prevail under the other major classifications, resulting in probably a total of 12 or 15 allotments being issued during the entire year.

Making available obligated balances until expended.—In order that the activity may be able to intelligently plan expenditures so as not to create deficiencies in any one quarter, also to allow for obligations incurred during a quarter but not satisfied at the end of the quarter, the activity will be authorized to carry over amount of actual obligations from quarter to quarter, thereby increasing the amount available during the latter quarter. This is to provide for such work as may have been planned as a charge to a certain quarter but through delay or other causes actual expenditures can not be made during that quarter. Under the modified system provisions will be made to carry this obligated amount over to the succeeding quarter until satisfied.

3. It is requested that each commanding officer mail a reply within three days after the receipt of this letter stating his views with reference to the changes outlined herein. Any recommendations as to the most practicable method of carrying out the changes outlined will be appreciated.

E. R. Stitt.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Circular letter. LCW/JBC 132679(21).
Serial No. 309–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 5 February, 1924.

To: All medical and dental officers.
Subject: Instrument, plastic filling, Black's, Nos. 1 to 7, addition to Supply Table, Part II.

1. Black's type amalgam pluggers have been added to the Supply Table of the Medical Department, 1922, Part II, and should be inserted immediately after instrument, Arrington, etc., on page 39, as—

Instrument, plastic filling, with handle, Black's, Nos. 1, 2, 3, 4, 5, 6, 7	number	7	7

2. A supply of these instruments is now on hand and may be obtained on requisition from the naval medical supply depots at Brooklyn, N. Y., and Mare Island, Calif.

E. R. STITT.

Circular Letter. AWD JBC 129733(22).
Serial No. 310–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 11 February, 1924.

To: All Naval Hospitals.
Subject: Assignment of light duty to hospital patients.
Reference: Manual of the Medical Department, paragraphs 1631–1682–1797.

1. This bureau is in receipt of complaints from beneficiaries of the Veterans' Bureau, patients in naval hospitals, regarding assignment to light duties in hospitals, and while relatively infrequent, indicate the desirability of a further expression of policy.

2. The utilization of the services of convalescent enlisted patients is based upon the above reference. Attention is invited to the requirement that the detail for light duty is made primarily by the ward medical officer, but the specific duty may be assigned by the nurse or hospital corpsman in charge, subject to the limitations stated in paragraph 1682. This employment in light duties is believed to be salutary in effect and as observed is being readily accepted by the patients.

3. This practice may be extended in a similar manner as far as practicable to patients coming under the Veterans' Bureau and to other supernumeraries, but it should be limited to duties connected with the order and cleanliness of the institution.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

4. This authority must be tactfully exercised and details to light duties are not to be made except after the determination of the physical and mental fitness of the patient for such assignment.

5. There is no objection to the acceptance of the services other than those specified above if volunteered by patients, provided such services may be regarded as in the nature of rehabilitation and not in any way liable to affect adversely the physical or mental condition of the individual.

6. This bureau's circular letter, serial No. 100–1921, is hereby canceled.

E. R. STITT.

Circular Letter. NHM:MAD F–3–42022.
Serial No. 311–1924.

DEPARTMENT OF THE NAVY.
BUREAU OF MEDICINE AND SURGERY.
Washington, D. C., 12 February, 1924.

To: All medical officers, chief pharmacists, and pharmacists.
Subject: Form N. M. S. H. C. 3 forwarding of in the case of hospital corpsmen whose records have been closed for desertion and convicted of absence without leave, or absence over leave, or restored to duty.
Reference: (a) Navy Department Letters No. 1–24 of 22 January, 1924.
b) Paragraph 403, Manual of the Medical Department.

1. In order that that the records of this bureau may be corrected it is directed that in the future a Form N. M. S. H. C. 3 be forwarded in the case of all hospital corpsmen whose records have been closed for desertion, but who have subsequently been restored to duty or have been tried and convicted of absence without leave or of absence over leave.

F. L. PLEADWELL, *Acting.*

Circular letter. (ERS):ESK 126039(22).
Serial No. 312–1924.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., 15 February, 1924.

To: All medical officers.
Subject: American Red Cross.

1. The Bureau of Medicine and Surgery regrets to note that some of the officers of the Medical Corps of the Navy are not familiar with the United States Navy Regulations which pertain to the American Red Cross.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

2. Attention is invited to section 6, paragraph 1470, and especially to subparagraph 13, of the United States Navy Regulations, 1920. Volume 39, part 1, Public Laws of the Sixty-fourth Congress, 1915–1917, chapter 417, page 581, provides as follows:

"Hereafter the authorized number of surgeons in the United States Navy be, and it is herby, increased by one; and that hereafter the Secretary of the Navy be, and he is hereby, authorized to detail one or more officers of the Medical Corps of the United States Navy for duty with the military relief division of the American National Red Cross."

3. An officer of the Medical Corps of the Navy has been assigned to the American Red Cross as liaison officer between that society and the Navy Department since 1916. This officer is addressed as the "Director, Bureau of Naval Affairs, National Headquarters, the American Red Cross, Washington, D. C.," and is referred to as such in paragraph F–1205(c), Bureau of Navigation Manual, 1921. Communications regarding the Red Cross activities, personnel, etc., which the American Red Cross field directors at the naval stations are unable to act upon should be addressed to the "Bureau of Medicine and Surgery, Navy Department, Washington, D. C.," and will, by reference to the liaison officer, brought to the attention of the proper Red Cross authority.

4. The Red Cross liaison officer is the representative in matters concerning the Red Cross activities of the Surgeon General of the Navy, who represents the United States Navy Department on the central and the executive committees of the American Red Cross.

5. It is believed that in the future embarrassing situations will be avoided if the members of the Naval Medical Corps bear in mind the relations of the Navy Department and the American Red Cross, and take up necessary communications, etc., in the proper manner and through the proper channels, viz, the Bureau of Medicine and Surgery.

E. R. Stitt.

Circular Letter. (ERS):ESK 129733(23).
Serial No. 313–1924.

Department of the Navy,
Bureau of Medicine and Surgery,
Washington, D. C., 20 February, 1924.

To: All naval hospitals.

Subject: Disciplinary regulations referring to beneficiaries of the U. S. Veterans' Bureau in naval hospitals.

1. There is quoted, hereinafter, a letter addressed to the Surgeon General of the Navy by the Director, United States Veterans' Bureau, under date of February 18, 1924:

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

"(1) As you perhaps know, General Order No. 27–A of the Veterans' Bureau deals with the disciplinary discharges of beneficiaries in its hospitals. This order requires that each patient be given a hearing before a Disciplinary Board of three officers before being discharged from the hospital.

"(2) While it is believed that these regulations are being carried out in a general way as applied to Veterans' Bureau beneficiaries hospitalized in your institutions, complaints have occasionally come in from service organizations that patients have oftentimes been discharged by the commanding officer of the hospital without having a hearing before a disciplinary board.

"(3) It is desired that a uniform procedure covering disciplinary discharges be adopted. If disciplinary boards are functioning at present in the discharge of Veterans' Bureau beneficiaries from your hospitals, would you be kind enough to notify me, and on the other hand, if such Boards have not been appointed for this purpose, it would be appreciated if you will notify the commanding officer of each hospital to institute such measure."

2. You are requested to acknowledge the receipt of this circular letter and to inform the Bureau of Medicine and Surgery immediately concerning the information requested in subparagraph 3 of paragraph 1. In the event that a Disciplinary Board for beneficiaries of the United States Veterans' Bureau has not already been appointed at hospitals to which these beneficiaries are assigned, you are directed to appoint such board in accordance with U. S. V. B. General Order 27–A and to include this information in your acknowledgement of this letter to the Bureau of Medicine and Surgery.

E. R. STITT.

Circular letter.
Serial No. Special.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
January 19, 1924.

To: All medical officers.
Naval hospitals, ships, and stations.
Subject: Complement fixation tests for syphilis.

1. In view of the great importance of the complement fixation test in the diagnosis and control of the treatment of syphilis, it is desirable that standard methods be employed in all laboratories in the naval service where this test is performed. At the present time different methods are employed in different laboratories and this practice is not for the best interests of the service as the results obtained are not comparable in many instances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

2. Hereafter the following standard methods for performing the complement fixation test for syphilis will be employed at all laboratories in the naval service equipped to perform the test. It will be noted that directions are given for the use of the antihuman (Noguchi) hemolytic system and the homohemolytic system. The latter utilizing the native complement present in fresh human serum, to be used only in emergencies and at stations or on board ship where guinea pigs are not available. Whichever system is employed no departure will be made from the methods of performing the test which are described, and the tables governing the titration of the various reagents will be strictly followed. The methods described have proven after years of practical use to be simple and accurate and are to be adopted as the official methods for use in the naval service.

3. In reading the tests and in reporting results the following system of recording results will be used:

(++) double plus, indicating complete inhibition of hemolysis.

(+) plus, indicating less than 50 per cent hemolysis.

(+−) plus minus, indicating more than 50 per cent hemolysis.

(−) minus, indicating complete hemolysis.

The double plus reaction is regarded as a positive reaction; plus and plus minus as suspicious; and the minus reaction as negative, but the interpretation of these reactions must rest with the clinician.

4. The standard methods recommended will be known as the antihuman complement fixation test and the homohemolytic complement fixation test for syphilis, devised by Noguchi.

Technique of the Antihuman Complement Fixation Test (Noguchi) for Syphilis.

Aside from the reagents used in this test the following special apparatus will be needed: Pipettes of 1 c. c. capacity graduated to deliver 0.01 c. c.; 10 c. c. pipettes graduated to deliver 0.1 c. c.; small test tubes, the best dimension being 10 by 1 cm.; larger test tubes for complement, antigen, and cell suspension; capillary pipettes (Wright's); test-tube racks with two parallel rows of holes and a centrifuge. A hot-air incubator or, better, a water bath will be needed for incubation.

In handling the reagents and glassware chemical and bacteriological cleanliness should be observed. Glassware should be thoroughly rinsed with boiling water and allowed to dry without wiping. Ordinary soaps, weak solutions of acid and alkali, bichloride of mercury, and other chemicals have a destructive action on the delicate erythrocyte, and test tubes which have been in contact with these substances must be thoroughly washed and rinsed in clear running water,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

finally being boiled in pure water and dried previous to use in the test.

Physiological salt solution (0.9 of 1 per cent) should be freshly prepared, boiled, and cooled before use.

The following reagents are used in this test: Blood cell (erythrocyte) suspension; complement; antihuman amboceptor; antigen; blood serum to be tested.

PREPARATION OF THE BLOOD CELL (ERYTHROCYTE) SUSPENSION.

The suspension can be prepared from the blood of the patient being examined or from normal individuals. Blood is collected in tubes or flasks containing sodium citrate (2 per cent) in normal (0.9 of 1 per cent) salt solution, using approximately 1 c. c. of blood to each 9 c. c. of the sodium citrate solution. After being thoroughly shaken the mixture is placed in graduated centrifuge tubes and centrifuged four times, the supernatant salt solution being poured or pipetted off each time and being replaced with salt solution. After the last washing the supernatant fluid is removed and enough salt solution added to the *packed cells* to make a 5 per cent suspension. The cells should be packed thoroughly and the amount noted before the salt solution is added. Each 0.1 c. c. of packed cells will make 2 c. c. of a 5 per cent suspension.

Complement.—Guinea pig's serum not more than 36 hours old is used. Preferably large male animals are selected. Obtain 6–8 c. c. of blood from two or more pigs by heart puncture and keep at room temperature in stoppered test tube until clot forms and the serum separates. Then centrifuge, pool the sera and place in a sterile test tube and thereafter when not in use keep in the refrigerator. To each 1 c. c. of clear serum add one and one-half times the volume of salt solution, making a 40 per cent dilution.

Amboceptor.—Antihuman amboceptor reagent paper will be supplied by the United States Naval Medical School, Washington, D. C., upon request or may be prepared at the larger institutions having the necessary facilities. It is the blood serum of rabbits which have been immunized to human erythrocytes. Various methods may be used for immunization, but a method that has given excellent results with extremely low mortality among rabbits is as follows: Large rabbits receive intravenous injections of 5 c. c. of a 20 per cent suspension washed human blood corpuscles at seven-day intervals for 3 injections. Allow a seven-day rest period and then give daily injections of 2½ c. c. of 20 per cent washed blood cells for a period of five days. After a week the rabbit serum will usually contain amboceptor of high titre. If the serum titre should be low, repeat the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

series of 2½ c. c. injections, which will usually bring the serum up to the requisite titre. When the preliminary titration to be described shows that the serum contains sufficient hemolysin the animals are bled and the serum preserved.

Antigen.—Only the acetone-insoluble fraction of tissue lipoids introduced by Noguchi will be used. Experience has shown that a suitable acetone-insoluble antigen accomplishes all that is possible, and is applicable with both the inactivated and the unheated serum. (See standard textbooks for preparation.) The antigen may be obtained from the United States Naval Medical School.

Emulsion of antigen.—The method of adding the salt solution to the stock antigen is very *important.* The amount of stock antigen to be used in a series of tests (0.1 c. c. of antigen and 0.9 c. c. of saline is sufficient for 10 tests) is placed in a test tube and the salt solution added drop by drop, the mixture being shaken thoroughly each time a drop is added. The antigenic value of the same sample of antigen may differ greatly according to the manner of preparation of the saline emulsion. If the antigen be added to the salt solution or the salt solution be rapidly added to the antigen a faintly bluish white emulsion is obtained, while mixing drop by drop we get a whitish opaque emulsion. These two emulsions by actual titration will vary greatly in their antigenic power; the milky opaque emulsion (made by thoroughly shaking) will be about four times as strong as the opalescent emulsion (rapid mixing) for the same specimen of syphilitic serum.

Collection of human serum.—The amount of serum required for the test varies according to the system used. Sufficient serum may be obtained by drawing 5 to 10 c. c. of blood from the median basilic vein of the patient with a sterile syringe or blood system and placing in a sterile tube. Serum will separate in a few hours at room temperature or may be centrifuged. Pour or pipette the serum into a sterile test tube and place in the refrigerator. If left in contact with the clot the serum will be tinged with hemoglobin and will interfere with the reading of the test. The serum is heated to 56° C. for 20 minutes to inactivate. Unheated serum, not more than 24 hours old, kept in the refrigerator, is used in the homohemolytic system.

Titration of materials used in the test.—The amboceptor and antigen are titrated before issue from the United States Naval Medical School, but owing to temperature changes and other factors, should be titrated carefully at frequent intervals. While the complement is variable the amboceptor is more or less constant and the former should be titrated against a definite amount of amboceptor. This should be done before each series of tests. While complement is

Digitized by Google Original from UNIVERSITY OF MICHIGAN

variable it will rarely be met with, and complement-deficient guinea pigs should be eliminated from breeding stock.

Titration of complement.—The titration should be made as illustrated in the following table, using the standard (5 per cent. cell suspension, amboceptor or known strength, and 40 per cent dilution of the guinea pig serum.

Titration of complement.

Tube No.	Amount of complement.	Amount of saline.	Amount of amboceptor (units).	Amount of 5 per cent cells.
1.....	0.03	0.9	2	0.1
2.....	.04	.9	2	.1
3.....	.05	.9	2	.1
4.....	.06	.9	2	.1
5.....	.07	.9	2	.1
6.....	.08	.9	2	.1
7.....	.1	.9	2	.1
8.....	.1	.9	0	.1

Incubate in water bath at 37° C. for one-half hour or the bacteriological incubator for one hour. The tubes are shaken every ten minutes to liberate the amboceptor from the paper in which it is impregnated. After incubation the first tube showing complete hemolysis is noted and the amount of complement in it is called the complement unit. Tube No. 3 containing 0.05 c. c. of complement usually will show complete hemolysis and would constitute one unit of complement and in making the test twice this amount or 0.1 c. c. would contain two units. Tube No. 8 containing no amboceptor should show complete inhibition or absence of hemolysis.

Titration of amboceptor.—Preliminary titration of the serum of immunized rabbits is made in the following manner: The blood is collected from the rabbit's ear in a Lyon or Wright capsule, the serum separated and inactivated at 56° C. for 30 minutes. Prepare a 1 to 100 dilution (0.1 c. c. of serum and 9.9 c. c. salt solution) and increasing amounts of this dilution are then placed in tubes as follows: 0.05, 0.1, 0.15, 0.2, 0.25 c. c. To each tube is added 0.1 c. c. of 5 per cent red cell suspension and two units of complement and sufficient salt solution to bring up the volume of each tube to 1 c. c. An amboceptor suitable for placing on paper will give complete hemolysis in the tube containing 0.1 c. c. of the 1 to 100 dilution or a titre strength of 1 to 1,000. If it is not, the immunization is continued. If hemolysis is complete the rabbit is bled, and the blood serum, after inactivation at 56° C. for 30 minutes, is placed on Schleich and Schulls No. 597 filter paper, the paper being cut in pieces 10 by 10 cm. and thoroughly impregnated. The impreg-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

nated paper is dried and cut in strips 5 mm. wide and various lengths are used in titrating against the previously standardized complement.

Titration of amboceptor paper.

Tube No.	Amount of complement. (units).	Amount of saline.	Millimeters of amboceptor paper.	Amount of 5 per cent cells.
1.....	2	0.9	5 by 1	0.1
2.....	2	.9	5 by 2	.1
3.....	2	.9	5 by 3	.1
4.....	2	.9	5 by 4	.1
5.....	2	.9	5 by 5	.1
6.....	2	.9	None.	.1

Incubate in water bath or incubator as for complement titration, shaking every 10 minutes to liberate the amboceptor serum, and after 30 minutes the titration is read. The first tube showing complete hemolysis is noted and the amount of paper contained in that tube is called one unit of amboceptor. A good paper should show complete hemolysis is tube 2 or 3. In making the test two units of paper are used. For instance, if one unit was found by titration to be 5 by 2 mm., a piece 5 by 4 mm. should be used in the test.

Titration of the antigen.—The antigen should be titrated to determine its hemolytic, anticomplementary and antigenic properties. Before titration the antigen is diluted as described on page 3.

Titration of antigen for anticomplementary properties.

Tube No.	Amount of complement (units).	Amount of saline.	Amount of antigen 1:10.
1.....	2	0.9	0.05
2.....	2	.9	.1
3.....	2	.9	.15
4.....	2	.9	.2

Incubate for 30 minutes at 37° C. in water bath or incubator for one hour and add to each tube 2 units of amboceptor and 0.1 c. c. of the 5 per cent red cell suspension.

Repeat incubation, shaking tubes every ten minutes.

After the second incubation the titration is read and all of the tubes should show complete hemolysis. If any one of the four tubes shows inhibition of hemolysis the antigen is anticomplementary and should not be used in the test.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Titration of antigen to determine antigenic properties.

Tube No.	Amount comp. units.	Amount of luetic serum.	Amount of saline.	Amount of antigen 1:10.		Amount of 5 per cent cells.	Units amboceptor.
1	2	0.1	0.9	0.05	Incubate at 37° C. in water bath, or 1 hour in incubator.	0.1	2
2	2	.1	.9	.10		.1	2
3	2	.1	.9	.15		.1	2
4	2	.1	.9	.20		.1	2
5	2	.1	.9	None.		.1	2
6	2	[1].1	.9	.20		.1	2
7	2	[1].1	.9	None.		.1	2
8	2	None.	.9	None.		.1	2

[1] Normal serum.

As a result of this titration, tubes 1, 2, 3 and 4, containing a known syphilitic serum and the antigen should show complete inhibition of hemolysis. Tube 1 sometimes shows a slight trace of hemolysis, and if only slight the antigen may be used. Tube 5, the control of the syphilitic serum, should show complete hemolysis. Tube 6, containing normal blood serum and antigen, should show complete hemolysis. Tube 8, the control of the hemolytic system, should show complete hemolysis.

The smallest amount of the antigenic emulsion that gives complete inhibition of hemolysis with positive syphilitic serum is called the antigenic unit, and this amount *is not doubled*, as is the unit of complement and amboceptor.

Technique of the test.—For each serum to be tested two tubes are necessary, an anterior and posterior one. In addition there must be a control set of two tubes for known positive serum and a control set of two for known negative or normal serum. Only one set of controls are necessary, no matter how many sera are to be tested. It is also well to have a control tube for the hemolytic system and one for the antigen.

In making the test proceed as follows: In each of the tubes mentioned place 0.9 c. c. of salt solution (0.9 per cent). In tube 1, anterior, place 0.1 c. c. of the serum to be tested and the same amount in tube 1, posterior. In tube 2, anterior and posterior, place 0.1 c. c. of known syphilitic serum, and in tube 3, both anterior and posterior, place 0.1 c. c. of known normal serum. *Add to each tube two units of complement* and one unit of the antigen (usually 0.1 c. c. of a 1 to 10 dilution) to each *anterior* tube. Incubate all the tubes in the water bath at 37° C. for 30 minutes. At the expiration of this time add to each tube *two units* of amboceptor paper and 0.1 c. c. of 5 per cent suspension of blood corpuscles. Incubate at 37° C. for 30 minutes, shaking the tubes every 10 minutes to liberate the amboceptor serum from the paper, place in refrigerator for one-half hour and read the results.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The positive control should show complete inhibition of hemolysis, while the negative control tube should show complete hemolysis. All the posterior tubes should show complete hemolysis and if syphilis is present the anterior tube containing the serum to be tested should show complete inhibition of hemolysis or varying degrees of inhibition, according to the length of time after infection, the amount and character of the treatment administered, and other factors influencing the strength of the reaction. The control tube of the patient's serum should show complete hemolysis. If syphilis is not present the anterior tube containing the patient's serum should show complete hemolysis. In the event there is complete inhibition in both the anterior and posterior tubes containing the patient's serum, the reaction is regarded as anticomplementary and the test should be repeated with another specimen of serum.

A very weak or doubtful reaction may sometimes be obtained in the case of undisputed syphilis. In such an instance the test should be repeated with 0.15 and 0.2 c. c. of inactivated serum. For examining the serum from known cases of syphilis for prognostic purposes the test must be made with 0.15 and 0.2 c.c., in case the routine amount no longer gives a positive reaction. In all cases it is a wise precaution to take blood for examination shortly before meal-time, and alcohol should be denied the patient for at least 24 hours previous to taking the blood.

The following table illustrates the method of making the test:

Serum for diagnosis.	Positive control.	Negative control.
Anterior tubes.	Anterior tubes.	Anterior tubes.
Patient's serum 0.1 c. c. Complement 2 units. Antigen 0.1 c. c. Saline 0.9.	Positive serum 0.1 c. c. Complement 2 units. Antigen 0.1 c. c. Saline 0.9.	Normal serum 0.1 c. c. Complement 2 units. Antigen 0.1 c. c. Saline 0.0.
Posterior tubes.	Posterior tubes.	Posterior tubes.
Patient's serum 0.1 c. c. Complement 2 units. Saline 0.9.	Positive serum 0.1 c. c. Complement 2 units. Saline 0.9.	Normal serum 0.1 c. c. Complement 2 units. Saline 0.9.

Incubate for one-half hour 37° C. or for one hour in incubator.
Add two units of amboceptor paper and 0.1 c. c. of 5 per cent red cell suspension to each tube.

TITRATION OF THE ANTIBODY CONTENT OF THE SYPHILITIC SERUM.

In order to measure accurately the exact strength of the antibody content of the patient's serum it may be titrated, as a syphilitic serum may give complete fixation with less than 0.1 c. c.—that is, we are able to distinquish the intensity of the reaction or determine the number of fixing units present in a given specimen of serum.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

To titrate the strength of inactivated serum prepare a 1 to 10 dilution by diluting 0.5 c. c. of serum with 4.5 c. c. of saline. Each tube will contain the patient's serum in varying amounts as shown in the following table:

Amount of diluted serum.

Tube No. 1	1.0	c. c.	(1:10)	equal to	0.1	c. c. inactivated serum.
Tube No. 2	.5	c. c.	(1:10)	equal to	.05	c. c. inactivated serum.
Tube No. 3	.4	c. c.	(1:10)	equal to	.04	c. c. inactivated serum.
Tube No. 4	.3	c. c.	(1:10)	equal to	.03	c. c. inactivated serum.
Tube No. 5	.25	c. c.	(1:10)	equal to	.025	c. c. inactivated serum
Tube No. 6	.2	c. c.	(1:10)	equal to	.02	c. c. inactivated serum
Tube No. 7	.15	c. c.	(1:10)	equal to	.015	c. c. inactivated serum
Tube No. 8	.1	c. c.	(1:10)	equal to	.01	c. c. inactivated serum

Having measured the amounts of serum into the tubes and brought the volume of the fluid in each tube up to 1 c. c. by uniformly adding salt solution, one now makes the test in the usual way. Add two units of complement and 0.1 c. c. of the standard antigen emulsion. Mix the contents well and incubate in water bath at 37° C. for 30 minutes. At the end of the incubation add to each tube 0.1 c. c. of 5 per cent red blood cell suspension and two units of amboceptor paper, and repeat incubation. If the specimen gives complete fixation in the first tube (1 c. c.), it is said to contain one unit of antibody. If it occurs in the second tube (0.5) it contains two units, etc. A specimen showing complete fixation in the last tube (0.1 c. c.) must contain at least 10 antibody units and may be further titrated to find out its real titer.

Cerebrospinal fluid.—Examination of the cerebrospinal fluid differs from that used for inactivated sera only in one respect, that of the quantity of the specimen used, which may vary from 0.1 to 0.5 c. c. No inactivation is required, as the cerebrospinal fluid contains no complement. In addition to the complement fixation test, the fluid should be examined to determine number and character of cellular elements, for pathological increases in the protein content and the Lange colloidal gold test.

Homohemolytic System for the Serum Diagnosis of Syphilis (Noguchi).

Under ordinary circumstances the antihuman hemolytic system, with guinea-pig complement, is most satisfactory, but in emergencies in which guinea-pig serum is not available (on board ship and isolated stations) a reliable diagnosis can be made by substituting human for guinea-pig complement. In certain exceptional cases where the complement content of the serum is below the average, special adjustment of the hemolytic system must be made. Even

Digitized by Google Original from UNIVERSITY OF MICHIGAN

this disadvantage, however, is removed by the use of a definite amount of normal human complement with inactivated serum.

Preparation of reagents.—The details with regard to the reagents used in conducting the homohemolytic system are essentially the same as those described in connection with the heterohemolytic system using guinea-pig complement.

The red blood cell suspension is prepared as previously described. Amboceptor paper and antigen are prepared and titrated as outlined.

The patient's serum is collected and kept in the ice box. Serum more than 24 hours old should not be used, unless inactivated by heating to 56° C. and the complement furnished by the addition of known normal human serum.

Titration of amboceptor.—In carrying out the homohemolytic system it is necessary to find the minimum hemolytic dose of anti-human amboceptor paper which will cause complete hemolysis in the presence of 0.2 c. c. of fresh human serum of 0.1 c. c. of 5 per cent human blood cell suspension in 15 minutes in the water bath at 37° C. Two amboceptor units are used in the test. The only difference between the action of the human and guinea-pig complement lies in the fact that the former requires more antihuman hemolytic amboceptor to render it active against the human corpuscles than the latter.

Positive and negative controls as in any other serodiagnostic procedure must accompany the serum to be tested. Where many tests are being made daily or every other day the necessary positive and negative sera will be furnished by the tests of the previous occasion.

Procedure for examining fresh human sera by homohemolytic system.

Serum for diagnosis.	Positive control.	Negative control.
Anterior tubes.	Anterior tubes.	Anterior tubes.
Patient's serum 0.2 fresh..... Antigen 0.1 c.c..... Saline 0.9 c.c.....	Positive serum 0.2 fresh..... Antigen 0.1 c.c..... Saline 0.9 c.c.....	Normal serum 0.2 fresh. Antigen 0.1 c.c. Saline 0.9 c.c.
Posterior tubes.	Posterior tubes.	Posterior tubes.
Patient's serum 0.2 fresh..... Saline 1.1 c.c.....	Positive serum 0.2 fresh..... Saline 1.1 c.c.....	Normal serum 0.2 fresh. Saline 1.1 c.c.

Incubate for 30 minutes at 37° C. in water bath or 1 hour in incubator.

Add 2 units ambroceptor to each tube and 0.1 c.c. of 5 per cent red cell suspension. Repeat incubation for same period.

Shake tubes every 10 minutes after the addition of amboceptor paper to liberate the amboceptor serum. Read results after the tubes

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

have stood at room temperature for 30 minutes. Readings of the test are made in the same manner as in the test using guinea-pig complement.

PROCEDURE FOR THE EXAMINATION OF SERA MORE THAN 36 HOURS OLD.

It is best to inactivate all sera more than 36 hours old by heating to 56° C. for 20 minutes, as specimens which have stood for this length of time in the refrigerator are inconstant in their complementary activity. Negative fresh human sera containing active complement is added to the inactivated serum. *For cerebrospinal fluid* 0.2 c. c. of fresh active negative human serum is added as complement.

Refer to the table illustrating the procedure for making the test with guinea-pig serum. Instead of the two units of complement used, 0.2 c. c. of active human serum is added and 0.2 c. c. of the serum of the patient. A complete test of the active negative serum used as complement should accompany the test as a negative control.

Specimens which fail to completely hemolyze in the control tube may be deficient in complement, and to these sets of tubes, both the anterior and posterior, another amboceptor unit may be added, the tubes placed in a separate rack and subjected to further incubation. Should the specimen still fail to hemolyze completely in the control tube, even with additional amboceptor, the serum should be tested again, by adding to them a quantity of fresh serum which has been shown to contain an average complement and at the same time to be devoid of syphilitic fixing substance (negative serum).

Results with this method correspond closely with the original Noguchi method in which guinea-pig complement is used. Occasionally weak positive or negative reactions are obtained with sera containing an excessive amount of complement. If complete hemolysis takes place in five minutes it is obvious that there is an excess of complement in the specimen, and if a negative or weakly positive reaction is obtained with such a serum the test should be repeated, the amount of serum used being reduced to such an extent that complete hemolysis takes place in the control tube in 15 minutes. Finally, it should be emphasized that only the acetone-insoluble (Noguchi) antigen should be used, as nonspecific positive reactions are encountered when cholesterin-fortified and plain alcoholic extracts are used as antigens.

E. R. Stitt.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Nav–621–WLB. 125653(12)

NAVY DEPARTMENT, *17 January 1924.*

From: Bureau of Navigation.

To: Commandant naval station, Guantanamo Bay, Cuba.
Commanding General, Marine Brigade, Port au Prince, Haiti.
Military Governor, Santo Domingo, D. R.
Governor Virgin Islands.
District communication superintendent, San Juan, P. R.

Subject: Transportation of insane patients.

1. The following is quoted from the Annual Sanitary Report of the U. S. S. *Kittery* for the year 1923:

"There has been no provision made for the care of the insane in the Medical Department. It is recommended that a suitable room be provided or that no insane patients be carried as medical survey cases aboard this vessel."

2. Upon recommendation of the Bureau of Medicine and Surgery the Bureau of Navigation desires that insane patients be transported on vessels other than the *Kittery* wherever practicable.

3. This is necessary in the best interests of the service and for the proper safeguarding of the patients themselves.

ANDREW T. LONG, *Chief of Bureau.*

WEE: SS PQ&MR

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., January 2, 1924.

MEMORANDUM FOR MEDICAL OFFICERS ON RECRUITING DUTY.

Subject: Closer relation between medical officers on recruiting duty and the Bureau of Medicine and Surgery.

1. For some time there has been much criticism of the results of recruiting, particularly the rejection of accepted applicants for physical and other defects disqualifying for the service which, in most instances, apparently should have been detected at the time of enlistment. The bureau believes that there may exist a misapprehension of the circumstances and conditions applicable to recruiting or of the instructions issued relative to the physical examinations. The bureau believes that a closer relationship between the medical officers on recruiting duty and the division of physical qualifications of this bureau, as well as the division of the Bureau of Navigation which handles the question of policy with regard to recruiting, will engender more satisfactory results and, it is hoped, less criticism.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

2. To this end, the bureau will issue from time to time memoranda for the information of medical officers on recruiting duty. These memoranda will comprise the presentation of cases in which there are outstanding physical defects or other defects such as unfit the man for service by reason of inaptitude, undesirability, or physical defect; questions of policy, questions of care with regard to certain defects, questions of expense, questions of subsequent hospitalization, or other matters of interest to the recruiting service.

3. The bureau directs that these memoranda be given careful consideration by medical officers, as it is of the utmost importance that a change be effected in the present situation.

E. R. STITT.

WEE: SS PQ&MR.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C., January 2, 1924.

MEMORANDUM FOR MEDICAL OFFICERS ON RECRUITING DUTY.

The bureau desires to invite attention to many physical defects ultimately disqualifying at naval hospitals in the case of newly enlisted men, which defects must have been present at the time of enlistment.

In this connection, the bureau desires to bring to attention conditions diagnosed as chronic myocarditis. There are several cases on the desk at the present writing:

In one case, the origin is attributed to influenza infection in 1918, inducing shortness of breath and smothering spells. The pulse at rest was 112 and after slight exertion was 134. There was marked pulsation of the vessels of the neck. Heart enlarged to the left. Apex beat diffuse and heaving. Sounds are rough. There are no murmurs.

Another case presents a systolic murmur, heard best over the base, increased by exercise. There is tachycardia upon exertion; poor physique; underweight.

Another case presents the pulse at rest of 120; after moderate exercise, 140. Marked throbbing of the vessels of the neck; pulsation visible on the chest wall. Feeble pulse, enlargement of the heart to the left 3 cm. Apex beats diffuse and heaving. The murmur is to be heard at the apex, soft and blowing in character and systolic in time. The second sound is soft.

Another case, in a long, flat-chested individual, the apex impulse is pronounced and is in the sixth interspace. The pulse at rest is

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

92; after exercise, 110. The blood pressure is 110 and 65. X-ray and electrocardiographic studies confirm the diagnosis.

Another case gives a history of pain about the heart with vertigo and recently has lost weight. The pulse rate at rest is 135, and after slight exercise is 150. The pulse is compressible. The heart is enlarged to the left. The apex beat is diffuse and heaving. A systolic murmur is heard at the apex, not transmitted.

Another case reveals a recruit undernourished and underweight; pale, pasty, dermatographic skin; hands cold and clammy; marked pulsation of the vessels of the neck. Heart enlarged to the left; the apex beat diffuse and heaving. Heart sounds sluggish and distant and the individual complained of shortness of breath and has a chronic cough.

The bureau presents these cases as a means of illustrating the errors of the recruiting service as obtained as a result of study of the rejected men at a naval hospital. It is believed that each one of the cases enumerated above should have been disqualified at the recruiting station, as the several men were discovered defective within a few days after their arrival at the training stations.

Therefore, special attention is directed to the fact that apparently many cases of heart affection are attributable or can be traced to previous attacks of influenza, pneumonia, defective teeth, tonsillitis, and other sources of infection. At least in many cases, a history may be elicited which should cause the medical examiner to give special attention to the heart.

E. R. STITT.

115738.

DEPARTMENT OF THE NAVY,
BUREAU OF MEDICINE AND SURGERY,
Washington, D. C.

To: Medical officers attached to recruiting stations at a distance from naval hospitals.

Subject: Applicants for appointment in the Navy Nurse Corps: Physical examination of.

1. In accordance with a recent decision, the physical examination of an applicant for appointment in the Navy Nurse Corps must be made by a naval medical officer within three months of date of assignment to duty. This examination will be made, whenever possible, at a naval hospital; but when this procedure entails an unreasonably long journey, the applicant will be directed to make an appointment for the examination with the medical officer attached to the nearest recruiting station.

2. It is directed that only a member of the Medical Corps attached to the recruiting station make this examination, and it is

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

requested that nurses reporting at the recruiting stations be shown every courtesy and consideration.

3. A circular for the information of persons desiring appointment in the Navy Nurse Corps is enclosed for your information and files; also a set of blank forms for application, and the form letter accompanying the blanks. Application for appointment should be made by letter in the handwriting of the applicant to the Chief of the Bureau of Medicine and Surgery.

E. R. STITT.

WEE:SS PQ&MR.
JANUARY 22, 1924.

From: The Chief of the Bureau of Medicine and Surgery.
To: All Medical Officers (examining boards).
Subject: Change in the Manual of the Medical Department.

1. Special attention of examining boards is directed to this change:

In paragraph 1407, at the end of the first sentence and the second line, add the words "except that the height of the candidate for any corps must be not less than 66 inches."

2. This provision appears to have been omitted from the new manual at the time of its first printing, and several cases have come to the attention of the bureau in which recommendation for underheight has been made for very short men and impression has apparently been gained that the qualification of 66 inches in height has been changed. Hereafter, members of examining boards will be guided by the foregoing provision as to the height of all candidates.

E. R. STITT.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

BOOK NOTICES.

Publishers submitting books for review are requested to address them as follows:

The Editor,
United States Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.
(For review.)

Books received for review will be returned in the absence of directions to the contrary.

INDUSTRIAL HEALTH, by various writers. Edited by *George M. Kober, M. D., LL. D., professor of hygiene, Georgetown University, Washington, D. C., and Emery R. Hayhurst, A. M., M. D., Ph. D., professor of hygiene and head of the department of public health, Ohio State University; consultant in industrial hygiene, Ohio State Department of Health.* P. Blakiston's Son and Co., Philadelphia, Pa., 1924.

Men who come into daily contact with sickness can not fail to experience a deep sympathy for their fellowmen, which is all the more pronounced when they realize that many of the diseases are preventable and hence much of human suffering is unnecessary. As a result that branch of medical science known as preventive medicine has been created, and one of the most interesting and beneficient of its subdivisions is the study of the relation of a workman's occupation to his health and longevity.

The present volume is a revised and extended edition of Kober and Hanson's "Diseases of Occupation and Vocational Hygiene." The contributors to it, 33 in number, are individuals who have specialized in industrial hygiene, and in their contributions they present what is known to-day concerning those factors in industry which if ignored result in definite ill-health and in some cases in true occupational diseases.

The subject matter is presented in five parts:

Part I deals with the general principles of maintaining health in industry and considers among other questions the cause and prevention of occupational diseases, standards for ventilation, sanitation and illumination, the personal hygiene of the worker, the economic loss from preventable sickness and accidents, general welfare measures for wage-earners, and the industrial medical service.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Part II considers the vocational hygiene of certain industries and callings which in themselves, because of their importance in our industrial life or in the health relationship of those employed, deserve special consideration and discussion. Among these industries may be mentioned mining and quarrying, pottery and the manufacture of clay products, iron, steel, and allied industries, and the textile industry.

Part III is devoted to a discussion of specific occupational diseases, the result of exposure to certain poisons, infections, substances, conditions, and methods of industrial applications.

Part IV covers the systemic occupational diseases, many of which must be carefully differentiated from similar disabilities due to other factors than injury. Here one finds discussions of the occupational affections of the nose, mouth, and throat, the eye, the ear, the skin, and of diseases of the blood, circulatory system, and kidneys.

Part V deals with the general principles of industrial health administration. It contains discussions of certain comparative occupation statistics and their use and fallacies, methods and scope of protective legislation, child labor, the woman wage earner, and the compensation act and its administration.

An interesting feature of the volume is an historical review of the development of industrial hygiene and its effects on public health.

As a large part of the practice of preventive medicine deals with the education of the general public, the authors of the various articles in this book have endeavored to present the subject more or less in the language of the intelligent layman, which makes the volume not only of value to industrial surgeons but to the leading men of industry whose cooperation is essential if the best results of industrial hygiene are to be attained.

MANAGEMENT OF THE SICK INFANT, by *Langley Porter, B. S., M. R. C. S. (Eng.), L. R. C. P. (Lond.), professor of clinical pediatrics, University of California Medical School; visiting physician, San Francisco Children's Hospital; and William E. Carter, M. D., assistant in pediatrics and chief of out-patient department, University of California Medical School; attending physician, San Francisco Hospital, San Francisco.* Second Edition. C. V. Mosby Co., St. Louis, 1924.

Notice of the appearance of the first edition of this book appeared in the Bulletin of September, 1922, at which time it was believed that the volume would attain popularity and find a permanent place in medical literature. The early exhaustion of the first edition and the appearance of the second confirm this belief.

In the revision the authors have remedied a few errors and omissions and have incorporated the more important and practical of the advances made in this subject since the first printing of the book. Among the new matter we note a timely chapter on prematurity.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

As in the first edition, the whole subject of the management of the sick infant is ably and concisely treated in three sections; the first of which deals with the predominate symptom noted in an infant's illness, such as vomiting, diarrhea, constipation, nutrition, hemorrhage, pain and tenderness, convulsions and syncope, fever, and cough. In the second part, the authors discuss the various disease entities which are met during infancy; and in the third, they consider some very practical methods of treatment which have been found to have stood the test of time in their practice in San Francisco. Each method is given in detail. Of special convenience are the chapters on formulas and recipes for infant's food, and on the employment of drugs in pediatric practice.

HUMAN PROTOZOOLOGY, by *Robert W. Hegner, Ph. D., professor of protozoology and William H. Taliaferro, Ph. D., associate professor of protozoology in the School of Hygiene and Public Health of the Johns Hopkins University.* The Macmillan Co., New York, 1924.

This book gives a detailed description of the different protozoa which live in man and contains the subject matter of the course in protozoology given by the writers in the School of Hygiene and Public Health of the Johns Hopkins University. The protozoa constitute one of the largest groups in the animal kingdom, both with respect to the number of species and the number of individuals. They have attracted the attention of many investigators and have been used extensively for the study of behavior, physiology, and genetics; and their importance as causative agents of disease has made them the objects of research of medical men as well as biologists. For these and other reasons the published researches on protozoa are very numerous and are widely scattered in the literature. The authors have set forth in this book first the general biology of the protozoa as illustrated by each group studied; then they give typical life histories of representative species, either from man or the lower animals, and finally they present a more detailed account of the species living in man.

The diagnosis of any disease which is produced by a protozoon rests fundamentally on the finding and recognition of the specific organism. The method by which this is done varies with the locality in the body in which the parasite is found, and for that reason the authors have considered the various methods under each species or group of species. They have deferred, however, giving a general account of fecal diagnosis until the reader has become familiar with all the protozoa which inhabit the intestines, hence we find the volume closing with an account of the diagnosis of intestinal protozoa in which are discussed the various methods of fecal examination, the vegetable organisms sometimes confused with cysts, and the coprozoic protozoa which represent nonentozoic free-living species which find

Digitized by Google Original from UNIVERSITY OF MICHIGAN

their way into the feces either through their cysts being swallowed with food or water or by contamination after the passage of the feces from the body.

An extensive bibliography is appended, and the volume is profusely illustrated by schematic drawings explaining structure and life history.

GENERAL AND INDUSTRIAL ORGANIC CHEMISTRY, by *Dr. Ettore Molinari, professor of industrial chemistry at the Royal Milan Polytechnic and at the Luigi Bocconi Commercial University.* Second English edition, translated from the third Italian edition by *Thomas H. Pope, B. Sc., A. C. G. I., F. I. C.* Part II. P. Blakiston's Sons and Co., Philadelphia, Pa., 1923.

Part I of this valuable treatise on general and industrial organic chemistry appeared some months ago, and those interested in this special branch of science will welcome the publication of Part II, which completes the author's discussion of the subject. Although the treatise is highly technical, it is so readable that one perusing it is entranced by the romance of industry.

Among items of every day interest one notes descriptions of the modern methods of manufacturing margarine, soap, candles, beet-sugar, starch and its derivatives, and paper.

The latter half of the volume is devoted to a discussion of the cyclic compounds. Here we find among other matter descriptions of the preparation of the coal-tar products; the phenols and their derivatives; the nitro-derivatives of aromatic hydrocarbons among which is trinitrotoluene, a substance of importance in modern gunnery; the nitrophenols, aminophenols, and thiophenols, which supply us with picric acid and phenacetin.

In the discussion of the aromatic acids which include tannin is a description of the modern process of tanning hides. An interesting sketch of the perfume industry is contained in a footnote to the author's description of the terpenes which often accompany the natural perfumes of fruits and flowers.

Much space is given to a consideration of the chemistry of the various coloring matters used in industry and to textile fibers.

FIGHTING FOES TOO SMALL TO SEE, by *Joseph McFarland, M. D., Sc. D., professor of pathology in the medical department of the University of Pennsylvania.* F. A. Davis Co., Philadelphia, 1924.

In this book, which had its inception in a series of popular lectures delivered by the author at the Wagner Free Institute of Science, of Philadelphia, the story of microbiology is told in a pleasing manner and in terms readily understood by the layman for whom the volume is designed. The author carefully explains to the reader how our present knowledge of the nature of the microbiologic causes of disease has come from patient investigations and how the knowledge

Digitized by Google Original from UNIVERSITY OF MICHIGAN

so derived has been applied to the prevention of disease. After a pleasing introduction he discusses with the reader in a chatty manner the nature of micro-organisms and the effects of those which are pathogenic; the various methods of transmission of the cause of disease from individual to individual; how nature prevents disease by an increase of the body's resistance; and the prevention of diseases whose micro-organsms are transmitted by insects.

The volume contains readable historical references illustrating the views of the Greek philosophers on the spontaneous generation of life and the behavior of the ancients toward contagious diseases, as well as extracts from Mathew Carey's account of the epidemic of yellow fever which occurred in Philadelphia in 1793, De Foe's "Journal of the Plague Year," "The Letters of Mary Wortley Montague," Bocaccio's introduction to the "Decameron," Pepys' "Diary," Vallery-Radot's (Pasteur's son-in-law) account of the first inoculation for rabies, Sir Ronald Ross's "Researches on Malaria," and David Livingstone's "Missionary Travels and Researches in South Africa."

The volume abounds in illustrations which add interest to the text.

This book will serve a useful purpose in the dissemination among the general public of a knowledge of those diseases caused by micro-organisms.

THE EXAMINATION OF PATIENTS, by *Nellis B. Foster, M. D., associate physician to the New York Hospital; associate professor of medicine at Cornell University College of Medicine.* W. B. Saunders Co., Philadelphia, 1923

The development of laboratory methods of diagnosis has had a tendency to divert attention from the use of the trained senses of touch, sight, and hearing employed with such success by the clinicians of former generations, and the aim of this book is to present, in a brief but practical manner, the methods of determining the facts revealed by physical examination on which accurate diagnosis rests.

The precision of the author's writing and the thoroughness of his method of routine examination of patients makes the volume of value to all engaged in general practice.

After some preliminary remarks on the theory of diagnosis and the assembling of data gathered during the taking of a patient's history, the author considers the physical examination *per se.* This is followed by a consideration of the examination of the various "systems" in which special methods of value in connection with the diagnosis of important diseases of the respiratory, cradio-vascular, digestive, and genito-urinary systems are described.

There are excellent chapters on rectal examination, gynecological examination, neurological examination, and the examination of the ear, throat, extremities, and breast.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

There is a description of the immunological tests to which are added some excellent colored plates showing various aspects of the Schick reaction.

LECTURES ON ENDOCRINOLOGY, by *Walter Timme, M. D., attending neurologist, Neurological Institute, New York; professor of nervous and mental diseases, New York Polyclinic Medical School and Hospital.* Paul B. Hoeber, New York, 1924.

This is a small book of 120 pages in which the author presents a moderately comprehensive view of the functions of the endocrine glands. The booklet is a reprint of an article which appeared in the Neurological Bulletin for January, 1921. So favorably was this article received by the profession and so constant was the demand for copies that its publication in book form seemed justified.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE.

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge.

Notes on Preventive Medicine for Medical Officers, United States Navy.

RESUSCITATION APPARATUS.

Although it is generally known that the Bureau of Medicine and Surgery does not approve the use of mechanical resuscitation apparatus, occasionally a recommendation is initiated by some medical officer that a lungmotor, pulmotor, or other type of apparatus be furnished. In some instances he has been led to make such a recommendation by criticism and the feeling on the part of others that all desirable provisions have not been made to save life in case of accident unless such apparatus is available.

It is easy to understand how the layman has come to have the idea that it is necessary to have such apparatus at hand if all that should be done is to be done for the victims of accidental submersion, asphyxiation from electric shock, and poisoning by carbon monoxide gas. Extensive advertising has led the public to this belief. There is always the danger that artificial respiration will not be applied promptly and effectively while awaiting the arrival of apparatus which has been sent for or is known to be on its way to the scene of the accident. The danger is so real, and so many lives that might have been saved have been lost through failure to begin the Schaeffer (prone pressure) manual method without unnecessarily sacrificing a single second, that the National Electric Light Association and other organizations recognize the tendency to wait as an all sufficient reason in itself for disapproval of resuscitation apparatus. Practical experience has shown time and again that employees can not be relied upon to become proficient in the manual method or to apply artificial respiration efficiently where apparatus is known to be available. Why not? The answer may not appear to be satisfactory but it is the psychology of the situation. It seems to be difficult to overcome the erroneous belief that the machine has life-saving power greatly beyond what can be expected of the simple manual method of artificial respiration, and consequently when an accident occurs all efforts are bent on getting the apparatus to the spot instead of beginning artificial respiration in time to save life.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

It has often been necessary in the interests of life saving to resist popular clamor for the purchase of apparatus after an accident. As a rule, when a lungmotor or pulmotor has been employed in a case of gas poisoning, asphyxia following electric shock, or submersion, and the victim has recovered, the newspapers credit the machine with having saved a life, when as a matter of fact the Schaeffer method of artificial respiration would have been fully as efficacious. In many gas poisoning cases the subject was still breathing when the machine arrived and received credit when merely the breathing of pure air was sufficient to insure recovery. When death occurs the incident does not make such good newspaper copy and the most that is to be expected in the write up is the statement that the apparatus was used but it arrived too late. The lay public and also many physicians have not looked into the question. Because of their superficial knowledge and ignorance of fundamental facts they have been led by newspaper accounts and widely advertised claims to assume that such apparatus should unquestionably be provided for bathing beaches, hospital ambulances, police stations, fire departments, etc. When a death occurs and such apparatus could not be procured it is not infrequently regarded as a deplorable event.

The whole question has been carefully studied by physiologists, surgeons, and engineers, by the Army, Navy, United States Public Health Service, Coast Guard, United States Bureau of Mines, and numerous industrial organizations, including mining corporations and the National Electric Light Association. The conclusion has been reached independently by various competent investigators, boards, and committees of eminent scientists that where life can be saved the approved prone pressure manual method of artificial respiration, properly performed, will save life, and where this method fails the apparatus would also have failed.

In any case of asphyxia, when respiration ceases there follows a brief period of a few minutes during which it is possible to restore breathing by artificial respiration. If breathing is not restored during this period there comes a "critical moment" after which life can not be saved by any method, means, or apparatus. It follows that every second is precious from the instant the victim is reached. The indicated procedure is to apply manual artificial respiration without the unnecessary loss of a single second, and to keep it up without interruption until the subject begins to breathe or it is certain that death has supervened. It can not be determined when efforts at resuscitation are begun whether or not the "critical moment" has been reached and passed.

Deprivation of oxygen for about 10 minutes irremediably damages some of the most essential nerve cells in the brain. Matters of pri-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

mary importance are the same whether asphyxia is due to carbon monoxide in the blood, to submersion in water, or to paralysis of respiration by electric shock. Lack of oxygen in the blood and tissues is the fundamental difficulty—hence, the prime necessity for promoting survival is the prompt renewal of an oxygenated blood supply.

In the case of electric shock the heart continues to pump for a few minutes, but the blood is not oxygenated because the muscles of respiration are temporarily paralyzed. The heart soon stops beating effectively and the victim dies of *simple asphyxia*. Artificial respiration by which the lungs are at once adequately supplied with ordinary air is a sufficient treatment. The usual normal tidal volume of air in the lungs is about 450 c. c. The exchange of air that can be brought about by the Schaeffer method of artificial respiration, while considerably less (40 to 70 per cent), is quite sufficient to prevent further damage to the tissues, and leads to the restoration of normal breathing, provided the tissues have not already been so seriously damaged as to preclude that happy result. The Schaeffer method is only better than the Sylvester method when the prone-pressure procedure is reinforced by the inspiratory position of the chest which the drawing up over the head, or, in other words, the extension of the arms forward, tends to induce.

By the Schaeffer method it is possible to expel air from the lungs to a degree not surpassed by vigorous voluntary efforts at expiration. Air is expelled during the pressure movement in exactly the same manner as during voluntary breathing. During the release-of-pressure movement air is inspired because of the partial vacuum created by increased cubic capacity within the chest, this likewise corresponding exactly to what occurs during normal breathing. With apparatus, air is either forced into the lungs under pressure or sucked out by creating a vacuum in the machine, or the movement of air is governed by the alternate employment of both methods in combination. In any event the result is not in accordance with physiological action. This may or may not be an important consideration, but it is obvious that damage to the lung tissues can be caused either by excessive pressure or too great suction.

The result is the same in case of submersion in water as in electric shock asphyxia, and likewise in suffocation due to a deficiency of oxygen or to reduction in the percentage of oxygen in the inspired air below the required minimum because of the presence of excessive amounts of carbon dioxide, methane, etc. In all such cases artificial respiration, by which the lungs are at once adequately supplied with ordinary air, is a sufficient treatment. Pure oxygen or air enriched with oxygen might shorten the recovery time somewhat, but ordinary air with a tidal volume of 225 c. c. will prevent further

Digitized by Google Original from UNIVERSITY OF MICHIGAN

damage to the tissues from oxygen deprivation. In drowning cases, of course, there is the mechanical difficulty brought about by the presence of water and froth in the lungs. This must be removed before either air or pure oxygen can enter the blocked-off alveoli.

In the case of carbon monoxide poisoning the situation is somewhat different. Carbon monoxide forms a temporary combination with hemoglobin just as oxygen does, uniting or separating from hemoglobin in virtue of the law of mass action in amounts determined by the partial pressures of oxygen and carbon monoxide, respectively, in the inspired air. In view of the fact that the affinity of carbon monoxide for hemoglobin is about three hundred times greater than that of oxygen for hemoglobin the presence of 0.05 per cent by volume of carbon monoxide in the inspired air will eventually render about half of the hemoglobin of the blood unavailable for transporting oxygen. With that concentration in the blood—that is, 50 per cent of the hemoglobin combined with carbon monoxide—most subjects are brought to the verge of unconsciousness. Fifty per cent saturation is just below the point where unconsciousness occurs with most subjects practically at rest. Physical exertion may lead to unconsciousness with less carbon monoxide in the blood. As little as 18 per cent of the saturation amount causes headache in some persons. Sixty per cent saturation is fatal if that much of the hemoglobin is bound for a sufficiently long time. Usually a man will die who has inhaled air containing 0.2 per cent of carbon monoxide for five hours or 0.4 per cent for one hour. When the inspired air contains from 2 to 5 per cent all of the hemoglobin in the blood will have combined after a few breaths and death follows almost as quickly as in drowning. With from 60 to 70 per cent of the hemoglobin combined with carbon monoxide, degenerative changes in the brain will start if the subject remains in this condition for half an hour, and serious nervous and mental impairment, if not death, will certainly follow with longer duration of oxygen deprivation.

Carbon monoxide is almost odorless and it has no irritant effect. The hemoglobin with which it has combined is not injured in any way, and after the combination is broken up the released hemoglobin is capable of transporting oxygen again just as though it had not been in combination with carbon monoxide. The percentage of total hemoglobin tied up will rise and fall if the percentage of carbon monoxide in the inspired air varies from moment to moment—especially if the subject breathes pure air or air comparatively free from this gas from time to time. As pointed out by Yandell Henderson, Sayers, and others, the effects of inhaling carbon monoxide are proportional to the length of time inhaled and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

the extent of oxygen deprivation, whether the time elapses during exposure to the gas or after exposure. More severe injury to the tissues is likely to result from long exposure to comparatively low concentration than to a short exposure to high concentration.

In view of these considerations it is understandable why cases of carbon monoxide poisoning cover such a wide range with regard to severity and duration of symptoms, the presence or absence of after effects, whether the victim is breathing or not, and whether he is partly conscious or deeply unconscious when discovered.

So far as treatment is concerned the principles involved are almost as simple as in the case of drowning or electric shock. It is necessary to get oxygen to the brain cells and other tissues as speedily as possible with the hope that they will not have been deprived of oxygen beyond the critical period after which recovery is out of the question, and with the hope, too, that deprivation during the time it existed was not sufficiently serious to cause degenerative changes that will result in permanent mental or nervous effects. It is obvious that the primary indication is to get the subject into pure air with the greatest possible celerity. If still breathing, and pure oxygen or a mixture of oxygen and carbon dioxide is available, any simple inhaler or even improvised means can be used to administer these gases which serve materially to hasten the elimination of carbon monoxide. If the victim is not breathing there is but one thing to do and that is to begin artificial respiration by the manual method at once, and it is indeed questionable whether this should be interrupted to adjust resuscitation apparatus if brought to the scene. If provided with oxygen one would not wish to forego the advantage of enriching the inspired air, yet this is not a sufficient indication for having the apparatus in readiness to meet such a contingency, for a simple mask may be used in conjunction with a flask of oxygen, or preferably oxygen and carbon dioxide, and held against the face during each inspiratory movement, the mask being lifted as the air is forced out of the subject's chest.

The employment of carbon dioxide in the treatment of carbon monoxide poisoning, as advocated by Prof. Yandell Henderson, is now recommended by other workers in the field. Surg. R. R. Sayers, United States Public Health Service, working with the United States Bureau of Mines, recently reported the results of experiments upon himself and others which the reader, doubtless, has already noted, as his article appeared in Public Health Reports issued by the United States Public Health Service for the week ended September 7, 1923. A mixture of oxygen containing from 5 to 10 per cent of carbon dioxide by volume is recommended. Sayers found that pure oxygen caused the elimination of carbon monoxide about four times as fast as normal air when breathed by persons

Digitized by Google Original from UNIVERSITY OF MICHIGAN

who had been gassed until 35 or 40 per cent of the hemoglobin in their blood was combined with carbon monoxide. The breathing of a mixture of oxygen containing 8 to 10 per cent of carbon dioxide caused the subject to breathe deeply and rapidly. Tests showed that under these conditions the carbon monoxide was eliminated about five to six times faster than was the case when normal air was breathed. He recommends that all victims not under the eye of a physician be caused to breathe oxygen in the purest form available for at least 20 to 45 minutes, and he recommends that physicians use the oxygen and carbon dioxide mixture where possible. The theoretical consideration that it is the accumulation of carbon dioxide in the blood that stimulates the respiratory center, thus appears to work out well in practice. Recovery from carbon monoxide poisoning depends to a great extent upon early elimination of the gas from the blood, and the rate of elimination depends upon the rate and depth of respiration as well as upon the percentage of oxygen in the air breathed.

In some cases, for an hour or more after relief measures are begun it is impossible for anyone to state whether the degree of poisoning has passed the danger point. On the other hand, the subject may be profoundly unconscious, yet if the duration of oxygen deprivation has not been too great, half an hour in the fresh air without other measures may lead to a seemingly remarkable recovery. If apparatus is used it is likely to receive credit for the remarkable recovery, but not likely to be discredited when efforts at resuscitation fail.

There are other points to be considered in the treatment of carbon monoxide poisoning which may be mentioned here, inasmuch as it has appeared desirable to discuss the fundamental considerations in relation to the possible value of resuscitation apparatus. Treatment is often required over a period of many hours or days. Profound asphyxia is but a part of the question. The question of whether breathing can be restored after respiration has ceased settles itself in a short time, and thereafter the carbon monoxide will be entirely eliminated in a few hours, but serious symptoms may persist. In all cases body heat should be conserved. The patient should be kept warmly covered. Nothing is to be gained by bleeding; on the contrary, the chances of recovery are likely to be reduced. Water should be regularly supplied by the Murphy drip method if the patient is unconscious and unable to swallow. Increasing acidosis may be combated with a 3 per cent solution of sodium bicarbonate given intravenously. Rapid elimination of the poisonous products of the incompletely oxidixed fats is the main consideration. Indications for transfusion of blood are to be considered.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

FOLLOW-UP TREATMENT OF SYPHILIS.

There is evidence that follow-up treatment of syphilis in the Navy is not uniformly complete and satisfactory. Study of statistical reports, entries in health records, findings at naval hospitals, and observations of the medical officer who gives the course of instruction in venereal diseases at the United States Naval Medical School lead to the conclusion that many of the younger medical officers are not thoroughly versed in the diagnosis and treatment of syphilis. Especially, they do not seem to realize the need for mercury and the need for adequate courses of the arsphenamine preparations at definite intervals in all cases until treatment is no longer required.

All medical officers are expected to inform themselves of the details of modern treatment of this disease. They are expected to have a correct understanding as to what constitutes scientific and adequate treatment both in the early and late stages of syphilis and to see to it that cases are not neglected.

Health records and Form F cards indicate a lack of proper follow-up treatment in too many cases. These records indicate that the instructions regarding the yellow abstract sheet in the health record are not being carried out. That sheet is intended to insure continuous and adequate treatment. It can accomplish its purpose only if medical officers see to it that all essential facts relating to treatment are recorded on the yellow sheet as given, and only if they look for yellow abstract sheets in the health records of all men transferred to the organization in which they are serving.

Of course, a sufficient and practical knowledge of the indications for treatment is a primary requisite in all cases.

Although the best results are not to be expected in every case of any disease by following fixed standards too closely, this subject has become so important that Lieut. G. P. Shields, Medical Corps, United States Navy, instructor in venereal diseases and urology at the United States Naval Medical School, will prepare an article for a forthcoming number of the Bulletin setting forth and describing a plan of treatment which, having the approval of the Bureau of Medicine and Surgery behind it, may be closely adhered to as a practical guide and approved standard method for the treatment of syphilis in all its stages. In following the plan as outlined, medical officers may feel that their patients are receiving adequate treatment and that indications for treatment are being followed in a manner that will merit the approval of competent syphilographers. Strict adherence to the suggested standard method will not be required. Medical officers should be left to the free exercise of judgment in dealing with unusual cases and in modifying treatment to meet special indications arising from conditions and circumstances that may surround any individual case.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Certain cases of syphilis which have come under observation at the United States Naval Hospital, Washington, D. C., serve to show that some medical officers at least are not fully aware of the fact that danger constantly attends the administration of either arsphenamine or neoarsphenamine. Careful technique is always a matter of importance. The most common faults in technique appear to have been underalkalization and overdosage, but in the case of neoarsphenamine there is evidence that some medical officers are still injecting the fluid into the vein at too rapid a rate. Such bad technique is always liable to result in a severe reaction.

Cases have come to the attention of the bureau wherein neoarsphenamine has been given after the development of a general dermatitis. In such cases there is danger of causing exfoliative dermatitis which has a case fatality rate of over 50 per cent. Even if recovery eventually follows the probabilities are that the patient will remain on the sick list for three or four months or longer. A case of this kind recently came under treatment at the naval hospital, Washington, D. C.

ACCIDENT STATISTICS—INJURIES AND POISONINGS.

Form F cards received up to this time reporting admissions for injuries and poisonings that occurred from January 1 to January 31, 1924, inclusive, indicate that 83.6 per cent of the cases occurred within the naval command, whether or not connected with the performance of prescribed duties or work, while 16.4 per cent of the admissions were for injuries or poisoning that happened while the men were on leave or liberty. Of the cases that occurred within the command—i. e., not while on leave or liberty—68.4 per cent were incidental to the performance of work or prescribed duties and 31.6 per cent were not so related. Of total admissions for injuries and poisonings recorded during January, 57.2 per cent were incurred in carrying on the work of the Navy in contradistinction to those which were associated with liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc.

Admissions were as follows:

	Within command.		Liberty, leave, or absent without leave.	Total.
	Connected with actual work, or prescribed duty.	Not connected with actual work, or prescribed duty.		
Injuries	91	40	24	155
Poisonings		2	2	4
Total	91	42	26	159

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Poisoning by narcotic drugs or ethyl alcohol reported as such under the preceding Navy nomenclature are now reported under the titles of "Drug addiction" and "Alcoholism," respectively, and hence are not included in the above figures.

In general, medical officers are furnishing the required data for injury and poisoning cases in a satisfactory manner, but some of the Form F cards which have come in indicate that the medical officer who returned the card failed to read the simple instructions contained in bureau circular letter 290—1923 with sufficient care to inform himself as to what is required on the back of the card in injury and poisoning cases.

Some confusion appears to exist regarding cases which should properly be recorded as, "In line of duty" on the face of the card although reported on the back of the same card as, "Not connected with work or the actual performance of duty." These two statements do not conflict. A man may not be engaged in any kind of prescribed work when injured and yet clearly be entitled to admission to the sick list as in line of duty. Even though the case is to be recorded as "In line of duty," the plan adopted for the compilation of Navy accident and injury statistics requires that in addition to the statement of origin information also be furnished as to whether or not the man was actually engaged in some kind of required or prescribed work when injured.

The question is, "Was an accident hazard incident to work of the naval service responsible for the injury?" This information is to be furnished in statement "2" on the back of the Form F card. Without a classification that will permit separation of injuries that are not associated with the performance of work or prescribed duties, from those that are, Navy accident figures can not be compared with other industrial accident statistics, including statistics compiled by life insurance companies.

Athletic exercises are always to be reported as not connected with work unless the exercises in question are a part of the prescribed daily routine, such as setting-up drill, swimming drill, etc. The prescribed language shown in the chart on page 4 of the circular letter should be used in all cases.

From month to month notes will appear in the bulletin regarding accidents that have occurred together with comment relating to cause or causes and consideration of means and methods which may be suggested or suggest themselves to prevent or reduce the incidence of such injuries. Cases which illustrate the need for safety devices or suggest that departmental or local administrative action may be desirable and useful in reducing similar hazards will be brought to the attention of the various bureaus. It is therefore important that the medical officer inform himself before reporting, "lack of safety

Digitized by Google Original from UNIVERSITY OF MICHIGAN

device," whether or not it is the common sense of those operating the machine or apparatus, or responsible for its operation, that a safety device would be practicable and useful.

In case there is a difference of opinion and the medical officer thinks a practical safety device could be designed it is in order for him to initiate correspondence that may be used as the basis of a recommendation which may lead to consideration or experimental work by the bureau concerned. In any event the ideas will be useful to the Bureau of Medicine and Surgery.

A "causative agent" must always be stated. In some cases the conditions and circumstances involved are such that the injury can not be classified by the statistician editing the card unless a fourth statement is given on the back of the Form F card as indicated in the above-mentioned circular letter. It should be clear enough to the medical officer forwarding the card what information will be necessary to permit interpretation. When in doubt add the statement. Cards that require a free sweep of the imagination before they can be classified will be returned.

In January three cases of serious injury were caused by the parting of cables and lines which had become defective from use. Two of these accidents occurred at naval stations and the other on board ship. In one case a fracture of the skull resulted, followed by death. In the second case the injury consisted of a fracture of both bones of the leg. In the third the injured man fell into a hold of the ship in which the accident occurred, sustaining contusions of the back and foot. Injuries from the parting of lines will probably occur from time to time, but it is to be hoped that those which have occurred will serve as widely as possible as reminders of the accident hazards involved in the employment of worn tackle.

Two accidents occurred at air stations as a result of coming in contact with radio propeller blades. In both instances the injury was reported as due to lack of a safety device. There have been other accidents due to this cause, and it is hoped that a safety device may be devised which will eliminate this class of injuries.

An injury was incurred through the bursting of a gauge glass. This is not an infrequent cause of injuries, particularly to the eyes and face. It would appear possible to extend the use of protective screening to all gauge glasses in the Navy.

One card reported the laceration of three fingers from handling sheet brass without gloves.

A finger was crushed while attempting to shift gears in a motor boat in the dark, the safety device designed to prevent this accident having been lost. This was reported as "equipment at fault." It would seem rather that the accident should be charged to negligence on the part of one or more persons. If the operator of the motor

Digitized by Google Original from UNIVERSITY OF MICHIGAN

boat did not make due effort to have the safety device replaced when lost, he was at fault; at any rate he knew the danger and should have taken adequate precaution to protect himself.

On board one of the large ships the distal phalanx of the left middle finger of a man was crushed in a sausage machine. The senior medical officer recorded, "lack of a safety device" in this instance. This is not an unusual accident. There are often reported lacerations of fingers, and even amputations of these members in the operation of bread-cutting machines.

On board another ship a fireman working in the fireroom was struck on the head by a lump of coal falling through an open manhole.

A report was received of a man injured on board ship because of a loose step on a ladder which turned, the man falling down the ladder. Prevention measures in this case are plain. Injuries due to falls on hatchways and ladders constitute one of the most frequent of all causes of injury on board. It should be the concern of the medical officer to study the circumstances in each case, with a view to informing those responsible in order that consideration may be given to the design and construction of ladders, condition of the ladder in question, rigging or position of similar ladders, and whether any corrective steps or measures are practicable.

Two injuries were reported due to the explosion of blank cartridges in rifles after they were supposed to have been emptied.

METHODS USED IN THE PREVENTION AND CONTROL OF COMMUNICABLE DISEASES AT THE NAVAL TRAINING STATION, HAMPTON ROADS, VA.

The following remarks are taken from the annual sanitary report of Commander C. G. Smith, Medical Corps, United States Navy, for the United States Naval Training Station, Hampton Roads, Va., supplemented by an additional statement regarding the importance of concurrent disinfection:

"There were two sharp outbreaks of measles during the year, the first occurring in January, reaching the peak in February with 127 admissions and gradually dying out until September and October, when there were no cases. The second outbreak of this disease occurred in November, in which month there were 49 admissions and 51 in December, the peak being during the last weeks of November and the first weeks of December, gradually diminishing during the latter part of December until only sporadic cases existed. Measles was not severe in type and occurred in units granted liberty in Norfolk, where the infection undoubtedly occurred. Norfolk, at both times, had fairly brisk epidemics of this disease. The present senior

Digitized by Google Original from UNIVERSITY OF MICHIGAN

medical officer has been attached to this station only since early in September, but from his observations during that time and from perusal of monthly sanitary reports he is of the opinion that the station has been remarkably free from severe illness of any kind.

"It has been the practice here and it is still in force to search out those who are ill by frequent trips during the day through bungalows by unit medical officers, as in this way the majority of those who are really sick may have rest and treatment before severe symptoms have developed. The general policy adopted is to eliminate exposure and fatigue in the beginning of illness, thus aiding normal resistance and giving the weak a better chance for recovery. This doctrine is preached to unit commanders, chief petty officers, company commanders, etc., and cooperation in this connection is usually satisfactory.

"From the writer's observation he feels compelled to state that the popular measure of disinfection to prevent the spread of communicable disease, while pleasing to the popular fancy, really is in great part bunkum, and where practiced with great faith attached to its efficacy more important measures are apt to be overlooked. Early detection of those 'sick' and prompt isolation does more good than any other one of several measures to prevent the spread of communicable diseases, and while this may appear simple on paper, in actual practice it requires more work and attention to detail than the measures popularly accepted as being more efficacious. It certainly gives those destined to be really ill a better chance for recovery."

The writer has little faith in terminal disinfection as an aid to prevent the spread of communicable disease, and he has no patience with those who advocate scrubbing down living spaces, from which communicable disease is taken, with a phenol or equivalent solution, or fumigating the same or doing other things equally as profitless and time consuming. Concurrent disinfection is another matter. In handling the patient all precautions are taken to prevent infection of other persons and cross infection. The practical measures that may be employed for this purpose are of undoubted value and proven worth.

At the training station communicable disease is practically always detected before the individual has become a bed patient. As a rule, the patient is transferred immediately to hospital so that during the interval before transfer he is not put to bed and there is not the need for typical bedside disinfection. However, the principles of concurrent disinfection are observed and so far as the danger of spreading the disease is concerned the patient may be regarded from a practical standpoint as hospitalized from the time he enters sick quarters.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

One must realize that authority is not entirely in the hands of the medical officer. The layman is not always educated away from the ideas of the past. He not infrequently regards as extremely important certain measures which the writer has designated, "popular measures pleasing to popular fancy," whch are time consuming and laborious, but are either entirely unnecessary or not worth the doing because it is the patient who is likely to spread the disease; not the quarters from which he was taken.

Commanding officers may be and sometimes are astounded when what is termed "bunkum" above is not practiced. They need to be educated.

VENEREAL DISEASE EXPERIENCE OF THE U. S. S. "DETROIT" DURING HER "SHAKEDOWN" CRUISE.

The following information is taken from the annual sanitary report of the U. S. S. *Detroit*, prepared by Lieut. E. D. McMorries, Medical Corps, United States Navy:

"The venereal disease problem has been the greatest single problem on this cruise. Before reaching foreign waters the entire crew were given lectures by the medical officer, by divisions, and posters and literature distributed. Prophylaxis was made compulsory upon returning to the ship for those men who had been exposed.

"Prophylactic tubes were issued to men going on liberty upon request. Until the ship reached Naples, Italy, no overnight liberty had been granted; thereby early prophylaxis was obtained with gratifying results. Upon arrival in Naples, Alexandria, Venice, and other ports where overnight liberty was given, the number of admissions to the venereal list began to increase as time of taking prophylaxis increased.

"An attempt to keep statistical data on cases after the use of a prophylactic tube in addition to prophylaxis aboard ship was abandoned as useless as the men would return under the influence of intoxicating liquors and the information was unreliable.

"The medical officer personally inspected the restricted districts in Funchal, Bizerta, Alexandria, and Oran and found in each instance the women to be of a low mongrel type, mixture of French, Spanish, Arabic, and Portuguese. The houses were all insanitary and conducive to disease. The fact that all women engaged in prostitution were under the surveillance of the police department and displayed cards with doctor's signature as a safeguard against being infected seemed to prove a snare and delusion to numbers of the bluejackets, who took the card to be proof 'par excellence' that the woman was free from disease.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

TYPHOID FEVER REPORT.

The following case of typhoid fever has recently been reported to the bureau:

Quartermaster, 3c, U. S. Navy. Admitted to the sick list, U. S. S. *Villalobos*, November 20, 1923. Diagnosis confirmed by laboratory findings November 26, 1923. Typhoid prophylaxis completed January 28, 1919, at the U. S. Naval Training Station, Newport, R. I.

ERADICATION OF VERMIN—NOTE FROM THE MARINE BARRACKS, WASHINGTON, D. C.

Although antivermin measures have been pursued for the past two years, the results never were satisfactory until these measures were systematized by the present commanding officer. For the past five months all mattresses and bunks have been sprayed biweekly with a cresol-kerosene solution. These frequent efforts at disinfestation have proved very beneficial and should be continued. The destruction of sheltering places for cockroaches, by filling in wall cracks with plaster of Paris, pointing around door and window sills in the galley and mess hall where roaches hide, is essential. Sodium fluoride has greater destroying property than the ordinary roach powder, and when systematically and judiciously used will reduce these pests. The first essential, however, in the galley and its divisions is cleanliness and care of food supplies to reduce the feeding places of these insects.

FOOD POISONING.

The following paragraphs are taken from the Annual Report of the Surgeon General of the United States Public Health Service:

"The studies of food poisoning were continued by Epidemiologist J. C. Geiger during the year 1923 in cooperation with the University of Chicago, Prof. E. O. Jordon, of the department of hygiene and bacteriology of that university having been designated as consulting hygienist of the service to have charge of the investigations. The term 'food poisoning' includes poisoning by food contaminated with bacterial organisms of the paratyphoid or other similar groups and intoxications caused by the poison produced by *B. botulinus*. These conditions are important from a public health standpoint on account of the considerable number of cases attributed to this source, the fact that they are apt to occur in small epidemics accompanied by sensational features and sometimes fatal results, the additional fact that erroneous and often unjust conclusions may be arrived at

Digitized by Google Original from UNIVERSITY OF MICHIGAN

if the investigation be not timely and careful, and finally because it is possible to prevent certain classes of these outbreaks by suitable measures. Poisoning due to fungi, 'milk sickness,' animal parasitic and dietary deficiency diseases are not here considered under the term 'food poisoning.'

"An analysis has been made by the service of 749 outbreaks, involving 5,210 persons, reported during the past 11 years as due to food poisoning. Following are some of the findings:

"1. The original diagnosis was not borne out by approximately 28 per cent of the clinical data secured on 212 outbreaks reported as food poisoning.

"2. The infectivity rate in the outbreaks of proved food poisoning varied from 75 to 100 per cent of those exposed.

"3. In 87 of the 749 outbreaks the food was regarded as 'spoiled' or 'off' in taste and odor at the time it was eaten.

"4. Epidemiologically the incubation period offers the best information for the differentiation of botulism and general food poisoning, the greater number of cases of botulism occurring after 24 hours and of general food poisoning before 24 hours.

"5. All of the cases of botulism investigated during the past year were in western States and were reported to be caused by home-canned products.

"The investigations have disclosed the need for fuller and better reporting and for the statistical regrouping and classification of the mortality from food poisoning."

IMPROVED SANITARY QUALITY OF FOODS NOW MARKETED COMPARED WITH CONDITIONS 10 YEARS AGO, AS OBSERVED IN DETROIT.

In touching upon the work of its bureau of food inspection the Detroit City Department of Health in its Weekly Health Review for the week ending January 19, 1924, remarks that the work of all three divisions of the bureau, comprising food, meat, and milk inspection, is chiefly educational in character. The writer holds no doubt but that a very much better understanding of sanitary principles exists among producers and food handlers to-day than was the case 10 years ago. The great majority of producers and dealers are not only willing but anxious to market a clean and safe product. "To-day," it is stated, "we rarely find an unscrupulous dealer. In a total of 1,145,230 inspections made by the three divisions in 1923 it was necessary to bring court action in only 55 instances. Although meat is inspected at the meat markets and commission houses, the greatest portion of it is inspected at the slaughterhouses.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

One hundred and nine million pounds, or 54,200 tons of meat, were thus inspected in the year 1923. In all, 522,197 pounds, or 261 tons, were condemned as unfit for human consumption. While considered alone this figure may appear large, it is small indeed when we consider that it represents but 0.48 per cent of the total, which means that over 99.5 per cent of all the meat inspected was found satisfactory.

"Milk is being supplied to the city of Detroit from about 10,000 farms. Each of these farms is thoroughly inspected at least once a year and reinspections made wherever it seems necessary. Milk is tested for sediment and butter fat at the country milk stations, later it is inspected at the city milk plants, and finally samples are taken from the milk wagons. Temperatures were taken of 440,887 cans of milk at the country milk stations. Of this number, a total of 7,301, or 1.6 per cent, were rejected on account of high temperatures. Of a total of 492,476 empty milk cans inspected 1,301, or 0.2 per cent, were condemned and 6,142, or 1.2 per cent, were returned to wash. As was the case with meat it appears that only a very small per cent of the milk is unsatisfactory. No milk-borne epidemics have occurred and it was not found necessary to prosecute a single milk dealer during the year 1923."

PHYSIOLOGICAL EFFECTS OF HIGH TEMPERATURES AND HIGH RELATIVE HUMIDITY.

The following summary of the studies carried on during 1923 under the supervision of Acting Asst. Surg. W. J. McConnell, United States Public Health Service, in cooperation with the Bureau of Mines Experimental Station at Pittsburgh, is taken from the Report of the Surgeon General of the United States Public Health Service.

"While the studies are not completed, partial results are available on which the following observations are based:

"(*a*) There is an inability of the body at rest and in still air to compensate for saturated atmospheric conditions exceeding 90° F.

"(*b*) The physiological effects resulting from exposure to high temperatures and humidities depend upon both the wet and dry bulb temperature readings.

"(*c*) The exhaustion and weakness following subjection of human beings to a very high temperature and humidity for a short period are not so severe as subjection to a moderately high temperature and humidity, but for a longer period.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

"(*d*) The highest dry and wet bulb temperatures attained and the length of time endured in the experiments are as follows:

Dry bulb.	Wet bulb.	Relative humidity.	Time, minutes.
112.5	112.5	100	35
120.2	104.02	60	40
147	108.4	30	45
157	100.43	15	45

"(*e*) The pulse rate appears to be a good indication of the extent of the discomfort experienced by the subject. Subjects became very uncomfortable after the pulse rate exceeded 135 pulsations a minute and complained of unbearable and distressing symptoms when the pulse exceeded 160 a minute. The highest pulse rate recorded was 184 a minute.

"(*f*) The systolic and diastolic blood pressure fell with moderate increase in temperature and humidity; and the systolic rose and the diastolic fell, thus increasing the pulse pressure, in high temperatures and humidities.

"(*g*) The curve of rectal temperature shows a close parallelism with the curve of the temperature of the test chamber at any constant humidity.

"(*h*) Subjection to high temperatures and humidities produces no marked change in the respiratory rate.

"(*i*) Loss of weight varies with the individual, the loss increasing with the length of exposure to high temperature and with the severity of the test.

"(*j*) The hemoglobin content of the blood increases proportionately to the loss in weight.

"(*k*) An estimation of the changes in the sugar content of the blood proved negligible.

"(*l*) A relative increase in the blood count was found but not an absolute one.

"(*m*) The rate of sweating varies with the atmospheric conditions. The losses of substances from the body through the sweat change in their proportions to one another.

"(*n*) Examination of the urine was negative for albumen and sugar, and the specific gravity increased.

"(*o*) Sweat is the chief factor in producing irritation and inflammation of the eyes.

"(*p*) Ice water, even when large quantities were swallowed, did not cause cramps under the conditions of the experiments."

Digitized by Google Original from UNIVERSITY OF MICHIGAN

SUPPLEMENTARY REPORT ON TENTATIVE BACTERIOLOGICAL STANDARDS FOR SWIMMING POOLS IN DETROIT.

The following additional information taken from the Weekly Health Review published by the department of health, Detroit, Mich., for the week ended February 2, 1924, will be of interest to those studying the problem of swimming-pool sanitation:

"It will be recalled that tentative standards for the control of Detroit swimming pools were adopted in November, 1923. This is the first report upon the bacterial condition of the water since that time. Among the standards agreed upon were the following:

"A median monthly bacterial count of not over 2,000.

"Not over 50 per cent of the samples during any given month shall show the presence of colon.

"Not over 20 per cent of the samples during any given month shall show a colon count of over 10 per 100 c. c.

"During the month of November 11 pools out of 21 failed to meet the tentative standards. In December 11 pools out of 25 failed. Seven failed to meet the standards during both months. On the combined report for the two months only 9 out of 25 pools satisfactorily met the requirements. Many pools, particularly the last ten on the list, will have to show a decided improvement if they are to continue to operate. It is significant to find that with two exceptions (the Knights of Columbus and the Clara Arthur) all of the first 13 pools on the list have some well recognized form of treatment. Of the last 12 pools on the list only three (the Atkinson, Northwestern, and Southwestern) have any treatment other than filtration. Not all of the 12 pools have even filtration.

"Comparing the condition of the water during November and December (since the adoption of tentative standards) with the condition for the year just preceding we find that while there has been a definite improvement in the colon content the median bacterial counts have increased. For the year ending November 1st, 1923, the actual average colon count was 19.75 per 100 c. c., since that time it has been 11.38. The median bacterial counts averaged 4,704 and 6,182, respectively.

"Some pools have shown definite improvement, notably the Cass Tech, Knights of Columbus, and Hutchins pool; others, including the McMichael Girls, the Balch, and the Y. M. C. A., have fallen very appreciably from their previous standings.

"The report indicates that while well recognized methods of treatment do materially help to maintain clean swimming-pool water they do not in themselves insure a clean and safe condition of the water. The equipment must be properly and continuously operated

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and the supervision of the pool and bathers must be constant and careful. That the type of treatment is not the only important factor in swimming-pool conditions is well brought out by the fact that three pools, all having the same type of treatment, stand 1st, 16th, and 22d on the list.

Presence of colon bacilli.

Standing.	Pool.	Median bacterial count.	Average colon per 100 c. c.	Percentage of samples more than 10 per 100 c. c.	Actual average colon count.	Type of treatment.	Standing in—	
							November.	December.
1	Cass Tech (new)	290	0	0	0	V. R.	1	3
2	Hutchins (girls)	465	0	0	0	Chl.	2	2
3	Hutchins (boys)	275	2.05	0	2.05	Chl.	6	5
4	D. A. C.	400	1.35	0	1.35	V. R.	4	6
5	*Knights of Columbus	300	2.0	0	2.0	None		7
6	D. Y. C.	97	3.25	0	3.25	V. R.	3	8
7	*Cass High (old)	7,250	0	0	0	Chl.		12
8	Clara Arthur (boys)	4,825	2.25	0	2.25	None	7	15
9	*Jefferson (girls)	2,150	2.5	0	2.5	V. R.		13
10	Barbour (girls)	10,005	.62	0	.62	Chl.	15	1
11	Barbour (boys)	10,100	.62	0	.62	Chl.	16	4
12	McMichael (boys)	6,075	2.3	0	2.3	V. R.	14	9
13	McMichael (girls)	1,500	1.8	5.0	6.3	V. R.	5	18
14	Balch	11,250	.7	0	.7	Hyp.	9	11
15	Northwestern	277	4.7	12.3	15.9	V. R.	12	17
16	Atkinson	13,000	1.0	0	1.0	V. R.	10	14
17	Y. M. C. A.	1,650	4.05	2.25	6.55	Hyp.	13	16
18	Northeastern	7,150	2.65	5.55	7.65	None	18	19
19	Clara Arthur (girls)	16,400	2.25	0	2.25	None	17	20
20	Southeastern	13,000	4.15	0	4.15	None	19	21
21	*Spa Baths	2,800	10.0	33.3	40.0	None		24
22	Southwestern	6,600	4.15	16.65	93.05	V. R.	8	22
23	Elmwood	14,500	.8	8.3	8.3	None	11	23
24	Northern	10,190	4.4	13.65	16.65	None	20	10
25	Central	14,000	5.6	16.25	65.25	None	21	25

* No water samples were taken from these pools in November.

"Average colon per 100 c. c. is the count when any presence of colon, whether it be 10, 100, or 1,000 is considered as 10.

"Under type of treatment, V. R. means violet ray, Chl. means liquid chlorine, and Hyp. means the addition of hypochlorite. Filtration is not, in this report, included as a type of treatment."

CORRECT REPORTING OF CASES REMAINING AT THE END OF THE CALENDAR YEAR 1923.

The below-mentioned ships and stations did not correctly report the cases "continued to next year" or "remaining" December 31, 1923, in accordance with instructions contained in paragraph 3418(b) of the Manual of the Medical Department, 1922. The Form F cards in these cases, as well as Form F, have been corrected in the bureau, but medical officers should make the necessary corrections on Form F cards (duplicate) and Form F in their files. The errors made can

Digitized by Google Original from UNIVERSITY OF MICHIGAN

be readily detected by comparison with the examples given in reference:

U. S. S. *Altair.*
U. S. S. *Bridge.*
U. S. S. *California.*
U. S. Naval Station, Guantanamo, Cuba.
U. S. Naval Air Station, Lakehurst, N. J.
U. S. S. *MacDonough.*
U. S. Navy Yard, Mare Island, Calif.
U. S. S. *Mississippi.*
U. S. submarine base, New London, Conn.
U. S. S. *New Mexico.*
U. S. S. *Newport News.*
U. S. S. *Pennsylvania.*
U. S. Marine Barracks, navy yard, Philadelphia, Pa.
U. S. Naval Prison, Portsmouth, N. H.
U. S. Naval Radio Station, San Juan, Porto Rico.
U. S. S. *Pyro.*
U. S. receiving ship, San Francisco, Calif.
U. S. S. *Savannah.*
U. S. S. *Sloat.*
U. S. S. *Tennessee.*
U. S. S. *Wright.*

HEALTH OF THE NAVY.

This report is for the month of March. Morbidity rates for all causes, including admissions for communicable diseases, have been lower than average since January 1. The median March rate for all causes, for the preceding five years, is 860 per 1,000 per annum. This year the recorded rate for that month is 608. As a rule, the general admission rate rises in November and December, reaching its peak in February and remaining high until spring is well advanced in the Northern part of the United States. This seasonal increase in sickness is almost entirely due to the common respiratory diseases. So far, 1924 has been an exceptional year. There have been no epidemics of influenza, and partly as a result of this there have been fewer admissions for tonsillitis and bronchitis. The March rate, 608 per 1,000, is actually lower than the corrected whole year rate for any year since 1917, in spite of the fact that calendar year rates are modified by the good health conditions which usually exist throughout the summer and fall. While the credit for reduced morbidity must probably be given to biological factors that are not under control, including the reactions of civil populations to the common communicable diseases, it is nevertheless probable that the increasing effect with which sound measures of prevention are applied wherever practicable, is also a factor.

Of the important communicable diseases, mumps is the only one showing an admission rate above the five-year median rate for March, and that is but little more than the expected rate—24.6 as compared with 22.6, per 1,000 per annum.

As a result of unusual prevalence of scarlet fever in several of the larger cities of the United States, a few cases have occurred among naval personnel. Five cases occurred at the naval training station, Newport, R. I. The outbreak was quickly controlled and the disease was confined to the members of one unit. Six cases

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

occurred at the naval training station, Great Lakes, Ill., during the month. Two cases recently occurred on board the U. S. S. *Arkansas* at the Navy Yard, New York, and a few other ships have reported single cases.

The following table shows rates per 1,000 per annum for the principal communicable diseases, March, 1914. For comparison, corresponding median rates are given for the same month, years 1919 to 1923, inclusive:

	March, 1919–1923.	March, 1924.
Cerebrospinal fever	0.08	0
Diphtheria	1.43	0.31
German measles	1.03	4.07
Influenza	115.44	25.04
Malaria	13.50	7.13
Measles	13.66	4.28
Mumps	22.57	24.63
Pneumonia	11.00	2.95
Scarlet fever	4.29	1.83
Smallpox	.56	.31
Tuberculosis	3.71	2.24
Typhoid fever	0	0

VITAL STATISTICS.

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$, or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

E. R. STITT.

TABLE NO. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of March, 1924.*

	Forces afloat.	Forces ashore.	Entire Navy.	Marine Corps.
Average strength	78,364	39,518	117,882	21,039
All causes:				
Number of admissions	3,047	2,923	5,970	1,333
Annual rate per 1,000	466.59	887.57	607.69	658.93
Disease only:				
Number of admissions	2,730	2,707	5,437	1,218
Annual rate per 1,000	418.04	812.98	553.43	602.08
Communicable diseases, exclusive of venereal disease:				
Number of admissions	935	1,191	2,126	430
Annual rate per 1,000	143.17	461.65	216.40	212.56
Venereal disease:				
Number of admissions	870	350	1,220	256
Annual rate per 1,000	133.22	106.28	124.18	126.55
Injuries and poisons:				
Number of admissions	317	216	533	115
Annual rate per 1,000	48.54	65.59	54.25	56.85

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No 2.—*Number of admissions reported by Form F cards for certain diseases for the month of March, 1924.*

	Forces afloat, Navy and marines, (strength, 78,364).		Forces ashore, Navy and marines, (strength, 39,518).		Total (strength, 117,882).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases	2,730	418.04	2,707	821.98	5,437	553.43
Injuries and poisons	317	48.54	216	65.59	533	54.25
Total admissions	3,047	466.59	2,923	887.57	5,970	607.69
Class II:						
Varicocele	2	.31	13	3.95	15	1.53
Class III:						
Appendicitis, acute	26	3.98	34	10.32	60	6.11
Autointoxication, intestinal	1	.15	5	1.52	6	.61
Cholangitis, acute	22	3.37	7	2.13	29	2.95
Cholecystitis, acute	2	.31	3	.91	5	.51
Colitis, acute	2	.31	0	0	2	.20
Constipation	13	1.99	15	4.55	28	2.85
Enteritis, acute	31	4.75	13	3.95	44	4.48
Gastritis, acute catarrhal	11	1.68	15	4.55	26	2.65
Gastroenteritis	13	1.99	32	9.72	45	4.58
Hemorrhoids	16	2.45	34	10.32	50	5.09
Ulcer, duodenum	0	0	1	.30	1	.10
Ulcer, mouth	0	0	1	.30	1	.10
Ulcer, stomach	1	.15	2	.60	3	.31
Total	138	5.82	162	49.19	300	30.54
Class V:						
Laryngitis, acute	2	.31	6	1.82	8	.81
Pharyngitis, acute	10	1.53	37	1.24	47	4.78
Rhinitis, acute	12	1.84	7	2.13	19	1.93
Total	24	3.68	50	5.18	74	7.53
Class VIII (A):						
Chicken pox	7	1.07	5	1.52	12	1.22
Diphtheria	2	.31	1	.30	3	.31
German measles	6	.92	34	10.32	40	4.07
Influenza	101	15.47	145	44.03	246	25.04
Measles	8	1.23	34	10.32	42	4.28
Mumps	110	16.84	132	40.08	242	24.63
Pneumonia, broncho	5	.77	5	1.52	10	1.02
Pneumonia, lobar	14	2.14	5	1.52	19	1.93
Scarlet fever	2	.31	16	4.86	18	1.83
Smallpox	2	.31	1	.30	3	.31
Total	257	39.35	378	114.78	635	64.64
Class VIII (B):						
Angina, Vincent's	16	2.45	34	10.32	59	6.01
Bronchitis, acute	173	26.49	154	46.76	327	33.29
Catarrhal fever	99	15.16	68	20.65	167	17.00
Tonsillitis, acute	352	53.90	388	117.82	740	75.32
Total	640	98.00	653	198.28	1,293	131.61
Class IX:						
Dysentery, bacillary	1	.15	65	19.74	66	6.72
Dysentery, entamebic	0	0	3	.91	3	.31
Total	1	.15	68	20.65	69	7.02
Class X:						
Dengue	20	3.06	16	4.86	36	3.66
Filariasis	0	0	1	.30	1	.10
Malaria	11	1.68	59	17.92	70	7.13
Total	31	4.75	76	23.08	107	10.89
Class XI:						
Tuberculosis (all forms)	6	.92	16	4.86	22	2.24
Class XII:						
Chancroid	245	37.52	76	23.08	321	32.67
Gonococcus infection	560	85.75	206	62.55	766	77.97
Syphilis	65	9.95	68	20.65	133	13.54
Total	870	133.22	350	106.28	1,220	124.18
Class XIII:						
Pleurisy, acute fibrinous	7	1.07	2	.61	9	.92
Class XX:						
Herniae	20	3.06	19	5.77	39	3.97

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for February, 1924, and from various shore stations for the five-week period March 2, 1924, to April 5, 1924.*

	Annual rate per 1,000 February, 1924.			Average rate since Jan. 1, 1924.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All ships	0	145.09	1,500.00	0	156.89	1,101.45
Battleship divisions:						
Battle Fleet	16.60	81.27	149.13	63.36	122.96	222.50
Scouting Fleet	46.19	155.89	493.97	104.54	186.23	373.28
Asiatic Fleet [1]	0	433.12	648.65	181.27	517.12	869.32
Destroyer squadrons:						
Battle Fleet	0	59.62	410.26	0	61.34	236.45
Scouting Fleet	0	38.49	330.27	0	111.59	482.14
Asiatic Fleet [1]	0	340.26	1,137.93	142.01	405.96	933.55
Miscellaneous: [2]						
Battle Fleet	0	135.87	1,384.61	0	125.19	692.31
Scouting Fleet	0	124.84	631.58	0	135.47	631.58
Asiatic Fleet [1]	0	302.13	514.28	0	296.13	885.24
Naval Forces, Europe	0	246.32	1,500.00	0	228.45	1,101.45
Special Service Squadron, bases on Panama	0	108.71	235.95	0	131.37	293.95
Naval Transportation Service	0	174.68	682.93	35.40	180.74	451.88
Special duty	0	186.53	697.09	0	187.22	444.44
Miscellaneous and district vessels	0	178.66	571.43	0	177.29	788.32

	Annual rate per 1,000 Mar. 2, 1924, to Apr. 5, 1924.			Average rate since Jan. 1, 1924.		
	Minimum rate.	Mean rate.	Maximum rate.	Minimum rate.	Mean rate.	Maximum rate.
All naval districts in the United States	0	71.50	262.63	0	69.01	272.14
First naval district	0	31.45	47.27	17.13	42.93	152.97
Third naval district	0	55.59	70.83	13.65	47.41	65.14
Fourth naval district	31.23	52.41	71.92	18.66	51.24	81.87
Fifth naval district	0	80.12	180.97	0	77.83	138.67
Sixth naval district	59.87	80.62	262.63	60.94	77.70	231.88
Seventh naval district	0	0	0	0	0	0
Eighth naval district	73.85	75.36	85.95	33.06	46.53	48.50
Ninth naval district	102.14	102.14	102.14	85.53	85.53	85.53
Eleventh naval district	44.67	84.81	141.77	45.69	69.15	86.56
Twelfth naval district	49.29	61.30	65.88	47.99	85.70	166.89
Thirteenth naval district	37.14	115.44	217.42	51.41	127.66	272.14

[1] Month of January, 1924.
[2] Vessels of train, base, air squadron, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for February, 1924, and from various shore stations for the five-week period March 2, 1924, to April 5, 1924*—Continued.

RATIO OF GONOCOCCUS AND SYPHILIS INFECTION TO TOTAL CASES OF VENEREAL DISEASES.

	Per cent, February, 1924.		Per cent since Jan. 1, 1924.	
	Gonococcus.	Syphilis.	Gonococcus.	Syphilis.
All ships	63.67	9.91	68.41	9.62
Battleship divisions:				
Battle Fleet	71.28	15.96	77.74	11.28
Scouting Fleet	75.58	3.49	83.33	2.45
Asiatic Fleet [1]	51.47	10.29	42.23	15.34
Destroyer Squadrons:				
Battle Fleet	82.14	7.14	78.95	12.28
Scouting Fleet	53.85	23.08	71.43	7.79
Asiatic Fleet [1]	64.79	9.86	51.89	9.57
Miscellaneous:[2]				
Battle Fleet	66.67	9.52	71.43	12.50
Scouting Fleet	61.11	9.72	69.03	7.74
Asiatic Fleet [1]	46.67	15.55	49.39	13.88
Naval Forces, Europe	38.81	8.95	48.82	7.09
Special Service Squadron bases on Panama	84.61	0	76.92	11.54
Naval Transportation	58.49	15.09	57.84	12.74
Special duty	78.20	5.13	70.07	7.30
Miscellaneous and district vessels	50.00	0	57.89	5.26
	Per cent Mar. 2, 1924, to Apr. 5, 1924.		Per cent since Jan. 1, 1924.	
All naval districts in the United States	71.20	12.50	77.85	9.84
First naval district	100.00	0	63.16	2.63
Third naval district	76.92	23.08	88.89	11.11
Fourth naval district	85.71	14.29	88.24	11.76
Fifth naval district	66.23	11.69	72.94	10.00
Sixth naval district	80.00	0	82.93	4.88
Seventh naval district	0	0	0	0
Eighth naval district	71.43	0	81.82	0
Ninth naval district	45.45	45.45	70.37	22.22
Eleventh naval district	70.83	4.17	74.00	10.00
Twelfth naval district	77.78	11.11	79.41	5.88
Thirteenth naval district	72.72	27.27	78.13	18.75

[1] Month of January, 1924.
[2] Vessels of train, base, air squadron, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 4.—*Number of admissions reported by Form F cards, and annual rates per 1,000, entire Navy, for the five-week period, March 2, to April 5, 1924, inclusive.*

	Navy (strength, 96,843).		Marine Corps (strength, 21,039).		Total (strength 117,882).	
	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.	Number of admissions.	Annual rate per 1,000.
Diseases of the blood	1	0.11	0	0	1	0.09
Diseases of circulatory system	27	2.90	14	6.92	41	3.62
Diseases of digestive system	343	36.83	108	53.39	451	39.79
Diseases of ductless glands and spleen	6	.64	0	0	6	.53
Diseases of ear, nose, and throat	440	47.25	93	45.97	533	47.02
Diseases of eye and adnexa	58	6.23	28	13.84	86	7.59
Diseases of genito-urinary system (non-venereal)	100	10.74	22	10.88	122	10.76
Communicable diseases transmissible by oral and nasal discharges	(A) 631 (B) 1,286	67.76 138.10	76 209	37.57 103.31	707 1,495	62.37 131.89
Communicable diseases transmissible by intestinal discharges	8	.86	62	30.65	70	6.18
Communicable diseases transmissible by insects and other arthropods	61	6.55	80	39.55	141	12.44
Tuberculosis (all forms)	24	2.58	3	1.48	27	2.38
Venereal diseases	1,320	141.75	256	126.55	1,576	139.03
Other diseases of infective type	273	29.32	48	23.73	321	28.32
Diseases of lymphatic system	57	6.12	20	9.89	77	6.79
Diseases of mind	45	4.83	17	8.40	62	5.47
Diseases of motor system	93	9.99	41	20.27	134	11.82
Diseases of nervous system	31	3.33	9	4.45	40	3.53
Diseases of respiratory system	46	4.94	8	3.95	54	4.76
Diseases of skin, hair, and nails	87	9.34	19	9.39	106	9.35
Herniae	38	4.08	9	4.45	47	4.15
Miscellaneous diseases and conditions	154	16.54	70	34.60	224	19.76
Parasites (fungi and certain animal parasites)	110	11.81	18	8.90	128	11.29
Tumors	6	.64	1	.49	7	.62
Injuries	506	54.34	109	53.88	615	54.26
Poisonings	7	.75	6	2.97	13	1.15
Dental diseases and conditions	16	1.72	7	3.46	23	2.03
Total	5,774	620.07	1,333	658.93	7,107	626.98

TABLE No. 5.—*Deaths reported, entire Navy, for the five-week period March 2 to April 5, 1924, inclusive.*

	Navy (strength 96,843).	Marine Corps (strength 21,039).	Total (strength 117,882).
Angina, Vincent's	1	0	1
Alcoholism, acute	1	0	1
Pneumonia, broncho	1	0	1
Pneumonia, lobar	1	1	2
Smallpox	1	0	1
Malignant growths	1	0	1
Other diseases	7	2	9
Drowning	5	1	6
Injuries	11	1	12
Poisons	1	2	3
Total	30	7	37
Annual death rate per 1,000, all causes	3.22	3.46	3.26
Annual death rate per 1,000, disease only	1.40	1.48	1.59

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

JUN 26 1924

VOL. XX NO. 6

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PLANNING AND PUBLICATIONS
CAPTAIN D. N. CARPENTER, MEDICAL CORPS, U. S. NAVY
IN CHARGE

EDITED BY
LIEUTENANT COMMANDER W. M. KERR, MEDICAL CORPS, U. S. NAVY

JUNE, 1924
(MONTHLY)



Compiled and published under authority of Naval Appropriation Act for 1924, approved January 23, 1923

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

TABLE OF CONTENTS

Page

PREFACE v

NOTICE TO SERVICE CONTRIBUTORS vi

SPECIAL ARTICLES:

DIAGNOSIS OF EARLY PULMONARY TUBERCULOSIS.
By Lieut. W. L. Rathbun, Medical Corps, U. S. Naval Reserve Force 685

PULMONARY TUBERCULOSIS, EARLY DIAGNOSIS AND TREATMENT OF.
By Lieut. Commander J. B. Pollard, Medical Corps, U. S. Navy 691

EXTENSIVE SUPERFICIAL BURNS.
By Lieut. Commander G. W. Shepard, Medical Corps, U. S. Navy 697

SULPHARSPHENAMINE, A REPORT ON ITS USE AT THE MAYO CLINIC, ROCHESTER, MINN.
By Lieut. Commander R. Hayden, Medical Corps, U. S. Navy 702

LEPROSY IN THE HAWAIIAN ISLANDS.
By Lieut. J. M. McCants, Medical Corps, U. S. Navy 705

CLINICAL NOTES:

KONDOLEON OPERATION AND FILARIASIS.
By Lieut. Commander H. M. Stenhouse, Medical Corps, U. S. Navy 715

MAXILLARY SINUSITIS OF DENTAL ORIGIN.
By Lieut. E. B. Howell, Dental Corps, U. S. Navy 716

REPORT OF A CASE OF LARGE "SOLITARY" TUBERCULOUS ABSCESS OF LIVER.
By Lieut. L. F. Robinson, Medical Corps, U. S. Naval Reserve Force 719

ADVANCED TUBERCULOSIS UNSUCCESSFULLY TREATED BY ARTIFICIAL PNEUMOTHORAX, COMPLICATED BY PYO-PNEUMOTHORAX AND TREATMENT BY THORACOPLASTY, A CASE OF.
By Lieut. (Junior Grade) E. W. Gutzmer, Medical Corps, U. S. Navy 721

NOTES AND COMMENTS:

A correction.—Value and limitations of the Röntgen ray in the diagnosis of pulmonary affections.—Sulpharsphenamine on board ship.—A note on interpretation of dental radiographs 727

NAVY NURSE CORPS:

MY FIRST DUTY ABOARD SHIP, THE U. S. S. "RELIEF" 739

BOOK NOTICES 751

PREVENTIVE MEDICINE, STATISTICS:

STUDIES OF SUBMARINE VENTILATION IN TROPICAL WATERS.
By Lieut. Commander R. F. Jones and Lieut. G. H. Mankin, Medical Corps, U. S. Navy 759

STUDIES BY THE UNITED STATES PUBLIC HEALTH SERVICE REGARDING CHEMICAL AND PHYSIOLOGICAL ASPECTS OF INDUSTRIAL FATIGUE 795

PREVENTIVE MEDICINE, STATISTICS—Continued Page

EPIDEMIOLOGICAL REPORT OF AN OUTBREAK OF BACILLARY DYSENTERY AT THE MARINE BARRACKS, RIFLE RANGE, SANTO DOMINGO CITY, DOMINICAN REPUBLIC.

By Lieut. H. B. LaFavre, Medical Corps, U. S. Navy 797

Bacillary dysentery among Marine Corps and Navy personnel serving with the gendarmerie of Haiti.—Bacillary dysentery in Guam.—Needless noise a detriment to health and efficiency.—Naval training stations, notes from.—Venereal-disease conditions from the U. S. S. "Pittsburgh," report on.—Fatal accident attributed to rusty surface of a revolving shaft.—Admissions for injuries and poisonings, January and February, 1924 800

INDEX I

PREFACE

The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April, 1907, as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, reports from various sources, historical essays, notes and comments on topics of medical interest, and reviews or notices of the latest medical books.

The bureau extends an invitation to all medical officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit and will recommend that copies of such letters be made a part of the official records of the officers concerned.

The bureau does not necessarily undertake to indorse all views or opinions which may be expressed in the pages of this publication.

E. R. STITT,
Surgeon General United States Navy.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NOTICE TO SERVICE CONTRIBUTORS

When contributions are typewritten, *double spacing* and wide margins are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form such as letterheads, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles, but still more so in reviews.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by a reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc. All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.*

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

U. S. NAVAL MEDICAL BULLETIN

VOL. XX JUNE, 1924 No. 6

SPECIAL ARTICLES

DIAGNOSIS OF EARLY PULMONARY TUBERCULOSIS[1]

By W. L. RATHBUN, Lieutenant, Medical Corps, United States Naval Reserve Force

Since the time of Laennec but very little progress has been made in the development of physical signs as a means for diagnosing pulmonary tuberculosis. Down through the years many signs bearing the names of very good men have been put forward as aids in determining the presence of intrathoracic tuberculous disease, only to be discarded as practically useless in the average run of cases, and a discussion of the relative merits of these so-called "refined" diagnostic procedures would only lead to confusion. In most textbooks much space and prominence are given to physical signs that are of doubtful value even in the hands of those with long experience in chest work. The diagnostic insignificance of these signs as interpreters of chest pathology in early phthisis has been brought out time and again when the findings at physical examinations have been checked by X-ray pictures. Before the advent and wide use of the X ray in chest work, numberless persons were diagnosed as cases of pulmonary tuberculosis on the strength of alterations in percussion note and breath sounds, who to-day would be pronounced nontuberculous. It would seem pertinent, then, to place our faith only in signs and symptoms that will bear out diagnosis, even when we are checked by a set of streoscopic X-ray films. The other signs are not used with confidence by those who are in continual contact with the tuberculous and can be of no greater value to the medical officers of the Navy. A definite routine should be adhered to when examining

[1] Lieut. W. L. Rathbun, U. S. Naval Reserve Force, the writer of this paper, has spent the past 20 years in the study of tuberculosis. Like many who have achieved eminence in this specialty, he was at one time a victim of the disease and was a patient of Trudeau. He has been connected with the Loomis Sanatorium, Stony Wold, and Ray Brook (the New York State Hospital for Incipient Tuberculosis). In 1908 he joined the staff of the New York City Municipal Sanatorium at Otisville, where finally he became physician in charge, which position he held for over six years. He next became superintendent of Stony Wold Sanatorium and is now superintendent of the Newton Memorial Hospital.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

a patient for pulmonary tuberculosis and the following scheme is recommended:

First. History.
- A. Exposure.
- B. Previous illness.
- C. Symptoms, past and present.

Second. Laboratory examination.

Third. Physical examination.

Fourth. X-ray examination.

HISTORY

A. *Exposure.*—In my experience with group examinations a larger percentage of cases of pulmonary tuberculosis is found among those with a definite history of massive exposure, particularly during childhood, than among persons who give a definite negative history of exposure. However, only about one-half of patients entering sanatoria for treatment give a positive history of intimate contact with a known case of pulmonary tuberculosis, so it would seem unwise to attach too much significance to any history of exposure to infection.

B. *Previous illness.*—Only those diseases known to have a definite bearing on the diagnosis of tuberculosis should receive consideration, viz:

Pleurisy with effusion.—Brown and Heise (1) found that 64 per cent of 47 cases of pleurisy with effusion showed parenchymatous lung lesions and 36 per cent peribronchial manifestations on X-ray examination of the chest. While not so important as a history of pulmonary hemorrhage, pleurisy with effusion must be given serious consideration and tuberculosis must be rigidly excluded before a negative diagnosis is made. Undoubtedly many of the peribronchial cases develop parenchymatous disease within five years after the attack.

Fistula-in-ano and the various tuberculous lesions of the bones, joints, kidney, and peritoneum are generally complications of pulmonary tuberculosis. Tuberculosis of the lymphatic glands is frequently associated with early pulmonary tuberculosis. A history of pneumonia, influenza, or lung abscess has no definite bearing on the diagnosis of tuberculosis, except from a negative standpoint. Most cases of chronic nontuberculous pulmonary disease date back their symptoms to an attack of one of these diseases.

C. *Symptoms, past and present.*—

Pulmonary hemorrhage.—Hæmoptysis is the most definite symptom of pulmonary tuberculosis. It is due to tuberculosis in 90 per cent of cases having it. It occurs in about 30 per cent of all

Digitized by Google Original from UNIVERSITY OF MICHIGAN

cases. A history of blood spitting (the coughing up of 1 dram or more of blood) is the most important symptom, as it means pulmonary tuberculosis in 90 per cent of cases; in other words, the chances of hæmoptysis being due to this disease are ten to one. Occasionally the physical signs and X-ray picture are negative immediately after a pulmonary hemorrhage and this fact has led many into the mistake of making a too hasty negative diagnosis. The most common explanation given as the cause of such bleeding is "rupture of a small vessel in the throat or bronchus." The state of nutrition of a suspected patient has practically no relation to the cause of a hemorrhage, and even if the patient is very well nourished it should not induce one to attribute this symptom to something other than tuberculosis. Hæmoptysis occurs in about 30 per cent of all cases of pulmonary tuberculosis.

Cough and expectoration.—Cough and expectoration when persisting over a prolonged period are important symptoms. However, these symptoms are often due to nontuberculous pulmonary disease, particularly when the secretion comes from the larger bronchi and lower lobes. Many of the nontuberculous pulmonary cases of long duration date back their symptoms to the "flu" epidemic of 1918–19. Some have coughed since early childhood.

Afternoon fever with increased pulse rate; loss of weight; lack of endurance and weakness; malaise; pains in chest, particularly during respiratory movement; dyspnœa on slight exertion; hoarseness; night sweats and clubbed fingers are important symptoms; but it must be borne in mind that all of these manifestations may be caused by diseases other than tuberculosis, such as focal infections, abscess of the lung and other forms of nontuberculous pulmonary disease. Symptoms are the surest indices of activity of a lesion, but *a diagnosis of pulmonary tuberculosis should not rest on symptoms alone.* Unless the sputum is positive for tubercle bacilli, we should have definite evidences in the way of physical signs and X-ray shadows before reaching a positive judgment.

LABORATORY EXAMINATIONS

Examination of sputum.—The findings of tubercle bacilli in the sputum is the surest evidence of the presence of pulmonary tuberculosis. At least 10 specimens of sputum should be examined, preferably on successive days, before assuming that a suspected sputum is negative for tubercle bacilli. The absence of tubercle bacilli from the sputum is not a sure indication that the patient does not have pulmonary tuberculosis.

The other laboratory tests are unreliable.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

PHYSICAL EXAMINATION OF CHEST

In examining a chest it is well to go ahead with the various procedures in definite order, leaving the least important until last. The usual practice prescribed, viz, inspection, palpation, percussion, etc., is not advised, as the first two are seldom looked upon as links in the diagnostic chain. Auscultation of cough should be the initial procedure in a chest examination, as it is the most important of all in its results. The cough used by the patient should be of the variety that disturbs secretion in the bronchi. It should be short or "hacking" and not violent, as the latter may drown out any rales that are present. When rales are not in evidence, or are heard only faintly, they are at times brought out well by a cough that comes near the end of expiration, or a succession of such coughs. The cough should be auscultated on both sides of the chest from apex to base, anteriorly and posteriorly. Persistent, moderately coarse subscrepitant rales occurring immediately after cough and during the first part of inspiration are practically pathognomonic of pulmonary tuberculosis when found in the upper part of an upper lobe, and will prove out in from 98 to 99 per cent of cases when checked by X-ray examination. There is no other physical sign that is so important, and it should be tried out very thoroughly on every suspect. These rales occur in showers and those heard directly after cough and before inspiration are the most important.

The moderately coarse subcrepitant rale is the sheet anchor in the physical diagnosis of early pulmonary tuberculosis. There is no description of the subcrepitant rale that can take the place of, or compare with, a practical demonstration on a case of pulmonary tuberculosis. Most physicians can give a perfect description of a subcrepitant rale but a surprisingly large number fail to recognize it in a patient, even when definite showers are present after cough. This is due, generally, to too much book knowledge and lack of proper drilling on actual cases of pulmonary tuberculosis. When present the moderately coarse subscrepitant rale is perfectly definite and requires no imagination on the part of the examiner to make it out. All types of rales confined to the apices or upper lobes, and persisting for long periods are important, but not nearly so much so as the moderately coarse subcrepitant. Fine rales over the upper part of an upper lobe mean tuberculosis in about 80 per cent of cases. All rales lose in significance as the bases of the lungs are approached. Medical men who seldom see cases of tuberculosis should pay occasional visits to institutions where such patients are treated and should auscultate cough after cough until they know the rales thoroughly.

Percussion.—Relative alteration in percussion note is of value only when present at the left apex. Definite relative dullness at the left

Digitized by Google Original from UNIVERSITY OF MICHIGAN

apex when compared with the right indicates the possible presence of pulmonary tuberculosis. Relative dullness at the right apex is normal and is of no diagnostic significance. When the percussion changes are so slight as to be only suspicious, no weight should be attached to them.

Breath sounds.—Auscultation of breath sounds is not an important procedure in the diagnosis of early phthisis.

Relative changes in breath sounds are of no significance except when found at the left apex. Definite relative respiratory changes at the left apex, as compared with the right, such as prolongation of expiration or harshness, may mean the presence of pulmonary tuberculosis, whereas "suspicion" of a change without rales should not be given serious consideration. After studying respiratory manifestations on 124 cases of pulmonary tuberculosis at the New York State Hospital for Incipient Pulmonary Tuberculosis, Ray Brook, N. Y., Bray (2) concludes: "A study of the breath sounds in early disease is often difficult and misleading, and for this reason should not be unduly emphasized in diagnosis."

Inspection and palpation.—Inspection and palpation are seldom of any value in early diagnosis. Bray and Duerschner (3) have shown that but little importance can be attached to the presence of supraclavicular depressions which formerly were considered to be reliable evidences of the presence of apical disease.

X-RAY EXAMINATION

All patients with definite or even "suspicious" physical signs or symptoms should be X-rayed. Some active lesions, particularly when situated at a distance from the periphery, as well as most latent or arrested processes, are demonstrable only by X-ray examination. The introduction of the X ray as a factor in the diagnosis of pulmonary tuberculosis was the one big advance in this field during the past century. The conservative physician is still unwilling to "throw away his stethoscope" and trust to the X-ray examination and that alone. Nevertheless, it is the general belief among those in tuberculosis work that the Röntgenogram is indispensible in the diagnosis of tuberculosis of the lungs and no patient suspected of having this disease should be declared negative until after an X-ray study has been made. It occupies a special field in diagnosis, and its value depends entirely upon the experience of those who read the pictures. Only those with special training are entitled to give a definite opinion, and for this reason a discussion of X-ray diagnosis does not come within the scope of this article.

Even though the physical signs and symptoms are indefinite and there is only a suspicion of the presence of pulmonary tuberculosis,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

X-ray pictures (preferably a set of stereoscopic films) should be taken of the chest, as many times definite lung lesions are found by this method when all other signs have failed. The X ray usually shows up more pathology than can be demonstrated by a physical examination, and this is particularly true when the lesion is situated at a distance from the periphery of the lung, or is latent or arrested.

In civil life the finding of an arrested or latent pulmonary lesion does not necessarily require on the part of the physician more than careful watching of the case and the usual advice concerning precautionary measures. However, in the service, where a man is constantly on call for certain duties that may require severe exposure, violent exercise, and periods of fasting, the presence of an arrested lung lesion is of the first importance and an applicant so affected has no place in the naval scheme of things. The X ray should be of great service in eliminating such military risks.

CONCLUSIONS

First. Moderately coarse subcrepitant rales, brought out by auscultation of cough and occurring in the upper part of an upper lobe, are the most reliable physical signs in the diagnosis of early pulmonary disease. When present, these rales mean pulmonary tuberculosis in from 98 to 99 per cent of cases. Persistent rales of any type are significant when confined to an upper lobe, but are not as important as the moderately coarse subcrepitant. Rales lose in diagnostic import, from a tuberculosis standpoint, as the bases of the lungs are approached.

Second. X-ray pictures of the chest hold a special and very important place in the diagnosis of pulmonary tuberculosis. Many times lesions are found on Röntgenograms that are not demonstrable by physical examination. Adequate facilities should be available for picturing the chest of all patients showing definite or even suspicious physical signs or symptoms.

Third. Hemorrhage from the lungs (the coughing up of 1 dram or more of blood) is the most important symptom of pulmonary tuberculosis. Ninety per cent of all pulmonary hemorrhages are caused by pulmonary tuberculosis. It should be borne in mind that the general condition of a patient, even though excellent, does not in any way preclude phthisis, as the etiologic factor in a pulmonary hemorrhage.

Fourth. Pleurisy with effusion, fistula-in-ano, and the various tuberculous lesions of the bones, joints, kidneys, and peritoneum are very frequently complications of pulmonary tuberculosis. Tuberculosis of the lymphatic glands is frequently associated with pulmonary tuberculosis.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Fifth. A diagnosis of pulmonary tuberculosis should not rest upon symptoms alone.

Sixth. Inspection and palpation are unreliable procedures.

Seventh. Changes in percussion note and breath sounds are of value only when alterations are observed at the left apex.

Eighth. A history of exposure to infection, even though severe, should not be given too much weight.

Ninth. When feasible, a course in the Trudeau School for Tuberculosis or a short service in a tuberculosis institution is recommended for medical officers who are not familiar with the physical signs of pulmonary tuberculosis.

REFERENCES

(1) Transactions of the Eighteenth Annual Meeting of the National Tuberculosis Association.

(2) Breath Sounds in Incipient Tuberculosis: H. A. Bray, Ray Brook, N. Y. The Journal of the American Medical Association, Nov. 24, 1917, Vol. LXIX, pp. 1762–1765.

(3) Supraclavicular Depressions in Diagnosis of Early Pulmonary Tuberculosis: H. A. Bray and A. H. Duerschner, Ray Brook, N. Y. The Journal of the American Medical Association, June 9, 1923. Vol. 80, pp. 1670–1674.

THE EARLY DIAGNOSIS AND TREATMENT OF PULMONARY TUBERCULOSIS[1]

By J. B. POLLARD, Lieutenant Commander, Medical Corps, United States Navy

The story of tuberculosis is one filled with pathos and human interest.

It has been a scourge of mankind since time immemorial and has been well termed the "white plague" and quite justly occupies the front ranks as the direct or indirect cause of a tremendous mortality rate, to say nothing of its crippling effects both from a physical and economic standpoint. Its distribution is so extensive that no race is exempt from its inroads, and there is apparently no such thing as racial immunity, though the converse is unquestionably true, as is testified to by the tremendous death rate from the disease among the Negro and Indian population of this country.

There are many pitfalls in the way of the diagnostician in arriving at the correct conclusion relative to the early diagnosis of tuberculosis; but as Osler and McRae state: "In no disease is diagnosis more important, for it has been clearly shown that not only the immediate but the permanent results of treatment are closely connected with and dependent upon the stage of the disease in which the diagnosis is made. He who waits for the tubercle

[1] Paper read at biweekly conference of medical officers, United States Naval Hospital, San Diego, Calif., Dec. 13, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

bacilli to appear in the sputum before making a positive diagnosis is apt to come to the conclusion that many cases of pulmonary tuberculosis have slight chances of recovery. Personal acquaintance with a patient or his family should have no negative value in diagnosis." As we all know the tubercle bacillus is no respecter of persons, nor of tissues, and practically all parts of the human anatomy may and do become involved in the disease process. This paper, however, will be confined to the discussion of the pulmonary type only.

In making a diagnosis of pulmonary tuberculosis a great many factors have to be taken into consideration in obtaining a proper interpretation of the picture as a whole. These factors, if properly correlated and the importance of each one correctly estimated, will, in the vast majority of cases, enable one to arrive at a very definite conclusion either for or against a tuberculous infection. It is unquestionably true, that a diagnosis of pulmonary tuberculosis is frequently not made, due in a large measure to the moral cowardice of the physician and not to the absence of signs of the disease. Fortunately we of the naval service do not have to contend with the fear of having our patient seek another physician, because we inform him of an unpleasant truth. Our interest is entirely humanitarian and the hope of remunerative reward does not enter into consideration. If an individual presents himself with symptoms referable to the thorax, the possibility of the trouble being due to tuberculosis must always be borne in mind, no matter whether the affection is acute or chronic. Tuberculosis is beyond a doubt the most important single disease that the practicing physician has to contend with and is also of great interest to the sanitarian inasmuch as it is quite prevalent among a great many domestic animals. There are three well recognized types of the disease; namely, chronic pulmonary tuberculosis, acute pulmonary tuberculosis, and fibroid tuberculosis. In making an early diagnosis of tuberculous pulmonary infection, too much attention can not be paid to the history of the case, for by this means alone presumptive evidence becomes so strong as to enable one to arrive at a definite conclusion in 80 per cent of the cases presented. Errors of diagnosis are generally due to lack of care and thoroughness in the examination and the failure to utilize all of the diagnostic means at our command and frequently a tendency to wait for a positive sputum. Further room for error becomes apparent when we fail in the accurate conception of the pathology of the disease and do not properly correlate the history and clinical findings.

Incipient pulmonary tuberculosis begins as a circumscribed infiltration involving a very small portion of the lung tissue and in a great many instances the spread of the pathological process is so slow and the symptomatology so obscure that a false sense of security may

Digitized by Google Original from UNIVERSITY OF MICHIGAN

obtain in the mind of the physician unless he has schooled himself to think of tuberculosis in all cases in which chest symptoms are present.

Given a suspicious case, we attempt to discover, first, whether or not there has been intimate exposure to infection over a protracted period, we next inquire into losses of weight, frequent colds, especially the summer variety, loss of energy, hemoptysis, pleurisy, with or without effusion, ischio-rectal abscess, cough, particularly in the morning, expectoration and fever of unknown origin. The existence of any of these symptoms, or conditions, should put us on our guard and every possible step taken to settle definitely the diagnosis. Local symptoms such as hemoptysis, cough, and pleurisy have greater diagnostic value than general symptoms such as rapid pulse, fever, loss of weight and strength, etc. When two or more of these are combined tuberculosis should be suspected and if associated with hemoptysis it is sufficient to subject the patient to treatment.

During some period of the 24 hours one usually observes some rise in temperature, even in the incipient case. If this does not occur Penzoldt's reaction should be tested, as exercise will almost always produce a rise of temperature in a tuberculous patient. Loss of weight and energy invariably occurs though the latter may be so insidious as not even to make an impression upon the patient.

Cough, as a rule, is the most frequent early symptom and, of course, immediately invites our attention to the lungs. Hemoptysis is one of the comparatively late manifestations of the disease but on the other hand it is sometimes the first alarm as far as the patient himself is concerned. Sudden unaccountable attacks of dyspnea or asthma are suspicious and should receive due consideration. The so-called idiopathic pleurisies are beyond a doubt of tuberculous origin and should be treated as such. It is a well-known physical fact that pathologic lesions in the lungs produce a group of reflex symptoms which are of considerable aid in making a diagnosis. These have been classified by Pottinger as follows: Hoarseness, tickling in the larynx, cough, circulatory disturbances, chest and shoulder pains, spasm of muscles of shoulder girdle, digestive disturbances and flushing of the face. These may occur, of course, in any pathological involvement of the lungs but as tuberculosis is the most frequent lung infection, it is but natural to be suspicious of that disease when these reflex disturbances are present.

The physical findings in early pulmonary tuberculosis are rarely ever sufficient to make a positive diagnosis through this means alone, but if considered in conjunction with the history and the clinical picture they become of great importance and assistance in arriving at definite conclusions. In using the time-honored methods of inspection, palpation, percussion, and auscultation, the two latter

Digitized by Google Original from UNIVERSITY OF MICHIGAN

give us most of our information in the early stages of the disease. Upon inspection one may observe lagging of the chest wall, this being partly true in cases of pleurisy with effusion, and, of course, attention may be invited to the lungs by observing the involvement of lymph nodes or the skin. Palpation is not of much value in the hands of most observers, but Pottinger lays a great deal of stress upon this procedure and claims that it is perfectly possible to outline the area of lung involvement by the sense of muscular resistance. Percussion may or may not give evidence of value, because there is rarely any real dullness over a beginning area of infection, but there may be diminished resonance, a higher pitch, and a feeling of resistance under the finger. In interpreting the percussion findings it is important to bear in mind that slight dullness is normally present over the right apex, the second intercostal space on the right, and the interscapular space between the last cervical and fourth dorsal vertebræ. Auscultation is by far the most important of the four methods and gives much more information than any one of the other three. In the use of this method one has to remember, as in that of percussion, that certain findings in one part of the lung mean a pathological condition, while similar findings elsewhere may indicate perfectly normal tissue; for instance, we get bronchovesicular breathing normally over the right apex, the second intercostal spaces close to the sternum, and also over the interscapular region. Bronchial breathing is normal over the trachea and larynx, and vesicular breathing is normal over all other parts of the lungs. Any change in breath sounds whereby the normal vesicular murmur becomes bronchovesicular in character or the bronchovesicular becomes bronchial with prolongation of the expiratory murmur, denotes infiltration, and if these signs are accompanied by rales which persist after coughing, one should not hesitate to make a positive diagnosis, provided other pathology has been ruled out.

Tuberculosis has a special predilection for the upper lobes of the lungs and any persistent modifications of the normal breath sounds or any adventitious sounds heard above the third rib anteriorly and fourth dorsal vertebra posteriorly should be looked upon with suspicion. If no rales are heard they may be brought out by instructing the patient to exhale, cough gently, then breathe deeply: this will not only bring out rales if they are present but will accentuate those heard during normal breathing. In any case with a suspicious history, X-ray examination should always be conducted, as it frequently shows structural changes before the physical signs become evident. Tuberculin as a means of diagnosis is of very little real value except possibly in the case of children.

The subject of treatment of pulmonary tuberculosis has been very thoroughly worked out and in the incipient stage the methods em-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ployed show very little variation among physicians specializing in this field.

Osler and McRae in their Modern Medicine state that there is probably no chronic organic disease which shows greater tendency to repair and recovery, but this very tendency is fatal for many patients. There is no disease that yields so quickly to such slight effort on the part of the physician, and no disease which progresses so steadily toward recovery in the face of so much injurious treatment. One of the greatest drawbacks in the successful treatment of a tuberculous patient is the fact that in a great many instances the period of treatment is entirely too short, due in a large measure to the lack of persistence on the part of the individual in carrying out the routine or that when he begins to feel well he becomes imbued with the idea that the doctor was mistaken in the diagnosis, and that he needs no further treatment. This attitude but serves to increase the mortality rate.

In tuberculosis, as in all other diseases, prophylaxis is the ideal toward which we should strive, but this can only be attained through world-wide instruction and intensive cooperation of physician and the public health services of all nations. Enforced public health education is the crying need and the only really successful method of combating the disease. The treatment of active pulmonary tuberculosis may be well divided into mental and physical. Each case should be individualized, and handled with firmness and common sense. It is peculiarly unfortunate that a spirit of pessimism prevails among the incipient cases whereas those far advanced take just the opposite view and are as a rule quite optimistic. Success in treatment depends largely upon the physician's ability to handle the physical and psychological problems that arise with each case. The patient should be informed that he has pulmonary tuberculosis, that the period of treatment is of necessity of long duration and that it is only through conscientious effort in carrying out the details of treatment that he can hope for a cure. He should be impressed with the idea that he is suffering from a curable disease and a spirit of optimism should be inculcated and cheerfulness enjoined. The doctor should make every effort to obtain the confidence of his patient as it is only through this means that the little worries, trials, and tribulations can be lifted from the mind of the individual and a wholesome mental attitude maintained.

Osler states that the cure of tuberculosis is a question of nutrition, which of course it is, inasmuch as proper digestion and assimilation of food raises the natural resistance of the body, thereby increasing its power in overcoming and preventing the spread of the infection. The fundamental essentials in the treatment of the disease consist

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of good nourishing food in proper quantity, plenty of fresh air day and night, with rest and exercise properly regulated for each individual patient. It is needless to say that a careful record in the form of a clinical chart should be kept on each case, showing temperature, pulse, respiration and weight, with, of course, entry of any unusual feature which might develop. Rest in bed is absolutely essential until the temperature has been normal for at least three days. After this the patient can begin taking graduated exercise but under watchful supervision, as it is infinitely better to err on the side of rest rather than that of exercise. Heliotherapy is considered by many workers a therapeutic agent of great value, but on the other hand there are conscientious objectors who believe it to be deleterious, citing statistics to show that the disease is more fatal among the dark races who live where the sun shines the brightest. This, of course, does not prove the case against the sun, but it should serve to remind us that excesses of any kind in tuberculosis are unwholesome and should be avoided. Climatic treatment is only a modification of the open-air method, and it makes really very little difference where the patient goes so long as he is in a pure atmosphere, an equable temperature with a maximum amount of sunshine. These climatic requirements are obtainable in certain mountainous sections of this and other countries and are responsible for the establishment of sanitoria in such places as the Adirondacks, the Rocky Mountains and the Alps. Altitude per se has no curative value. The specific treatment of tuberculosis has proven of service in the hands of some investigators, but its indiscriminate use is to be condemned, as it may do a great deal of damage.

Professor Dreyer, of the department of pathology, University of Oxford, has recently made some very interesting experiments in the treatment of tuberculosis. He found that when a vaccine is introduced into the body, it is essential that the antigen should come into intimate contact with the body cells if antibodies are to be produced. He assumed that the absorption of bacterial antigens from acid fast bacteria is hindered by the fatty envelope surrounding them, so he devised a method whereby a "defatted" or "diaplyte" antigen could be obtained. This was tried out first on guinea pigs and later in a hundred advanced human cases with marked improvement. Further developments and investigations will decide whether or not he has made one of the startling medical discoveries of the age commensurate with that of Banting in the treatment of diabetes; but whatever the ultimate outcome may be he has instituted a line of research that will stimulate other workers in this field, thereby adding greatly to our knowledge of bacterial immunity.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The treatment of special symptoms such as pyrexia, sweating, cough, hemoptysis, diarrhoea, and so forth, is not within the scope of this paper and will not be gone into.

In conclusion it will not be amiss to quote Sir William Osler's admonition to the general practitioner, in which he says: "The leadership of the battle against this scourge is in your hands. Much has been done, much remains to do. By early diagnosis and prompt systematic treatment of individual cases, by striving in every possible way to improve the social condition of the poor by joining actively in the work of the local and national antituberculosis societies, you can help in the most important and the most hopeful campaign ever undertaken by the profession."

Believing in this, as we do, let us foster the spirit of optimism which is so essential, fight the good fight, and teach our patients never to lose interest in life, for "Life loves those who love her."

EXTENSIVE SUPERFICIAL BURNS[1]

By G. W. Shepard, Lieutenant Commander, Medical Corps, United States Navy

Every naval medical officer is interested in the subject of burns because it is only a question of time when he will be called upon to treat this distressing condition, for unfortunately, burns of varying degrees of seriousness are not infrequent accidents to the Navy personnel.

Burns are injuries caused by heat. It may be direct exposure to flame, contact with solid heated bodies, or envelopment in heated gases as steam. All of these types are met with in the service—the most frequent being exposure to flame from ignited gasoline, possibly from a defective torch, an airplane crash, the flareback from an oil burner, or the flame of powder explosion, and exposure to escaping steam in the engine or fire rooms. Exposure to flame usually ignites the clothing and adds to the horror and suffering of the individual.

According to Dupuytren's classification there are six degrees of burns: (1) Erythema, (2) blistering, (3) partial destruction of the skin, (4) destruction of the entire skin, (5) destruction of the subcutaneous tissue and part of the muscles, and (6) carbonization of the entire part. The more common classification, however, makes three so-called degrees: (1) Erythema. With this the injury is confined to an inflammatory reddening of the skin which heals after a few days following a desquamation. (2) Blistering. In this the epidermis is lifted and there is a pouring out of serum. (3) Charring or carbonization in which the part is hard, anesthetic, brown

[1] Paper read at biweekly conference of medical officers, United States Naval Hospital, San Diego, Calif., Nov. 15, 1923.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

or black, and ultimately separates from the living tissue by ulceration.

The *symptoms* of burns are usually divided for convenience of study under three headings or subdivisions: (1) Those caused directly by the injury, (2) those occurring during the stage of inflammation, and (3) the repair stage.

During the first stage or immediately following the injury the patient suffers great pain and exhibits all the signs of shock. The skin is blanched. The surface temperature is reduced. The pulse is rapid and weak and the respiration shallow. The patient is very restless, partly from the pain and partly from the shock. The shock is caused, as in any extensive injury, by exhaustion of the nervous system. In cases where the burn is very extensive, the patient may never react, but die during this primary stage of shock.

If the patient survives the shock then we have the symptoms of the second stage. After about 48 hours the wound becomes less painful. Fever develops, caused at first by toxic absorption from the destroyed tissues, and later by the almost inevitable suppuration. There is a marked leucocytosis and polycythemia as well as a diminished coagulation time of the blood. This may cause thrombosis and embolism. There is a marked tendency to congestion of the internal organs. A bronchitis or pneumonia is likely to develop. The kidneys are practically always affected. Albuminuria appears early and there is liability of a severe acute nephritis with anuria. The gastrointestinal tract is also involved and there is apt to be vomiting and diarrhoea. A lesion described in all the textbooks is ulcer of the duodenum. This is known as Curling's ulcer and is said to be caused by toxic laden bile or embolism. Delirium or a mild grade of psychosis usually follows. This may be partly due to the nephritis but I believe it is largely caused by toxic absorption from the burned areas as I have seen it in some cases where there was little nephritis. During this stage, which lasts from two to four weeks or longer, there is active suppuration of the wounds with sloughing of devitalized tissue.

During the repair stage there may be no constitutional symptoms other than general weakness and anaemia. This condition is usually quite protracted.

The *prognosis* depends upon the age and resistance of the patient, and upon the extent and severity of the burn. The young and aged succumb quicker. Burns of the chest and abdomen are more grave than those of the extremities. As a rule, burns of the first degree extending over more than two-thirds of the surface of the body, or burns of the second degree extending over more than one-half the surface of the body, are fatal. I am very much impressed, personally, with the very little known factor of individual resistance or

Digitized by Google Original from UNIVERSITY OF MICHIGAN

toleration. Many cases recover which in the beginning seem hopeless, while on the other hand others, with apparently less severe injuries, die. Death may be caused by shock immediately after the accident, or later, to toxic absorption, concentration of body fluids, sepsis, or other internal complications.

The *treatment* of extensive burns resolves itself into constitutional and local. The first indication is to relieve the symptoms of shock. In this all are agreed. The pain must be relieved by morphine. This should be given in large enough doses and repeated often enough to keep the patient quiet, and will probably be required for 48 hours or longer. The body temperature must be kept up in this first stage with blankets and hot-water bottles, continuous warm baths, or warm air under blankets supported by a cradle. There must be a rapid and continuous introduction of fluids by all possible channels: Mouth, rectum, subcutaneous, or intravenous. Recent work by Bartlett (1) shows that absorption by proctoclysis is not as efficient as has been thought, and hence should not be relied on in the treatment of shock for burns, especially—one of the death-producing factors being the concentration of body fluids through loss of fluids poured out through burned areas.

According to Underhill (2) a man can not long survive a blood concentration of 140 per cent of the normal, 125 per cent being a dangerous limit. The blood concentration may easily be determined by simply making a hemoglobin estimation. Introduction of fluids also acts to dilute absorbed toxins, "hypothetic poisons said to be associated with severe burns," and also aids in their elimination.

In extreme cases of toxemia showing coma or convulsions exsanguination transfusion has been done with beneficial results. This consists in bleeding the patient 500 or 600 cubic centimeters of blood and replacing it from a suitable donor.

Fluids should be pushed long after the stage of reaction and a careful record made of the daily amount of intake and the output of urine. With these three means mentioned—relief of pain by morphine, maintaining body temperature, and introduction of fluids, our resources for the relief of the initial shock are largely exhausted.

In the local treatment of burns a myriad of substances have been advocated and used. The textbooks still give numerous substances for application and diverse methods of management, which is positive evidence that the last word has not yet been said. The ideal dressing would be comfortable to the patient, aseptic or mildly antiseptic, would provide free drainage, would not macerate nor stick to the tissues, and would not necessitate frequent changing. Unfortunately, it does not exist. Wet dressings macerate, dry dressings stick to the tissues, and ointments seal in the secretions and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

promote infection but they are frequently used because they are comforting to the patient.

The patient should be disturbed as little as possible until reaction has set in. After this the indications are to limit infection, to combat absorption toxemia, and to watch for and meet complications as they arise.

One of the oldest applications, and one still frequently used, is Carron oil. This consists of equal parts of lime water and linseed oil. It makes a comfortable dressing but is followed by much suppuration and becomes a filthy dressing.

Picric acid in 1 per cent solution applied as a moist dressing on gauze or lint is very frequently used. This has many advocates as it is antiseptic and tends greatly to relieve the pain. On small areas it no doubt is a satisfactory treatment, but on extensive burns it has no place on account of the great danger of poisoning the patient.

The continuous bath treatment consists in keeping the patient immersed continually in a bath of warm water at a temperature ranging from 100° F. to 105° F. This is a very excellent treatment as it is comfortable to the patient, softens the crusts, and takes up the continual flow of serum from the burned areas, thus limiting the toxemia. It also tends to keep the unburned areas of skin active. Its disadvantages are that it requires especially constructed tubs or tanks provided with a continuous flow of warm water, and also, it may interfere at times with other necessary indicated treatment, such as giving hypodermoclysis.

The ointment treatment and the more recently introduced paraffin dressings can be spoken of together. While they may be comfortable to the patient, I am not an advocate of their use as early dressings. They make occlusive dressings, shutting in the wound secretions and promoting the absorption of toxins. Also, with their early use suppuration will be more active and extensive. Later, in the treatment of granulating surfaces they act very nicely by protecting the wound and promoting epidermization at the edges.

Recently a communication was addressed to 14 hospitals scattered throughout the United States asking for the method used in treating extensive burns. Replies from 8 were received. Of these 8, all were agreed on the necessity of giving the primary attention, first, to the treatment of the shock. All of them force fluids and give morphine. But for the applications and dressings applied to the burned areas, a great variety was given. Only two confine themselves to one form of dressing, the others using two or more. The open-air method is used by five, paraffin dressings by four, moist dressings by three, boric-acid ointment by one, and liquid petrolatum by two.

The method used largely at this hospital during the past year with fairly gratifying success, has consisted of moist dressings, either

Digitized by Google Original from UNIVERSITY OF MICHIGAN

boric-acid solution, normal saline, and in some cases calomine lotion. The patients have all been received with first-aid dressing applied. These have been left in situ and the shock treatment outlined above instituted. When they have reacted, they have been placed in a portable tub of warm sodium bicarbonate solution. The dressings were cut off and all loose crusts and shreds of tissue removed while in the tube. They were then lifted back into the bed and the moist dressings applied. The dressings were kept moist by subsequent applications of the fluid used. The patients were tubbed and the dressings changed in this manner either every day or every second day, depending on the amount of wound secretion or on whether the dressings had been disarranged. In this treatment our primary idea was to limit the absorption of toxins and to diminish the chances of infection, which was probably met in this way nearly as well as by the continuous bath treatment which we were unable to use, not being equipped with tubs for that purpose.

With the moist dressings and tubbings used at this hospital we have not been altogether satisfied. The feasibility of disturbing a very ill patient by lifting him out of bed and placing him in a tub is sometimes questionable. With a large heavy patient three or more hospital corpsmen are required, and it is next to impossible to keep the bed dry and comfortable in cases where extensive moist dressings are required. It must be said in its favor, however, that the wounds keep clean, the detritus and shreds are easily removed, and we have had no infections.

The open-air treatment we look upon with favor and shall probably use it more. In cases treated at this hospital in which the face was burned as a part of the burned area, no dressings were applied to the face. The crusts were kept supple with sterile liquid petrolatum, and it was observed that these areas healed quicker and with less scarring and discoloration.

The management by the open-air method consists in placing the patient in bed between sterile sheets without any dressings. A cradle supports the blankets and the temperature within is maintained at about 105° F. by electric-light bulbs. Sterile liquid petrolatum is applied to the burned areas three times daily. The patient is treated in this manner during the entire course and disturbed as little as possible. Very little pus appears and the crusts keep soft and are easily removed and with little pain. It has for its advantages, simplicity, minimum disturbances of the patient, minimum of suppuration, and a minimum amount of scar tissue.

REFERENCES

(1) Willard Bartlett: After Treatment of Surgical Patients. Vol. I, Chap. LVI.
(2) F. P. Underhill: Arch. Int. Med. 32. July 31, 1923.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

SULPHARSPHENAMINE: A REPORT ON ITS USE AT THE MAYO CLINIC, ROCHESTER, MINN.

By R. HAYDEN, Lieutenant Commander, Medical Corps, United States Navy

Sulpharsphenamine, the latest arsenical antiluetic preparation placed on the market, is very favorably reported upon by the United States Public Health Service and by the British Navy. It is also becoming more generally used in this country, especially for neurosyphilis. During a tour of observation and instruction at the Mayo Clinic, the writer has investigated its use there with a view of ascertaining the adaptability of this drug for general use in the United States Navy.

Sulpharsphenamine is an arsenobenzene derivative prepared from arsphenamine, formaldehyde and sodium bisulphite. Its average arsenic content is 22 per cent, as against 30 per cent for arsphenamine. It is a light yellow powder, easily dissolved in cold water, and has been shown to have great stability both in the dry form and in solution. Sulpharsphenamine solutions remain clear and show no increased toxicity after 24 hours, whereas solutions of arsphenamine and neoarsphenamine show rapid changes in color and composition on standing. It is as cheap or cheaper than arsphenamine.

Voegtlin and Johnson, of the United States Public Health Service, 1923, have shown that the parasiticidal and spirocheticidal power of sulpharsphenamine appears to be at least equal to that of arsphenamine, though acting more slowly, producing a maximum spirocheticidal effect after three or four days instead of in 24 hours. Theoretically, this is an advantage. Based on the arsenic content of each, sulpharsphenamine has a greater spirocheticidal power than arsphenamine. Sulpharsphenamine has been shown to have marked ease of tissue penetration, being readily absorbed after intramuscular injections, and to be particularly effective in penetrating the spinal fluid. It has been shown to have practically the same effect upon trypanosomes in the spinal fluid as tryparsamid, a new drug under experimentation by Lorenz of Wisconsin, the Mayo Clinic, and Johns Hopkins.

Sulpharsphenamine may be administered subcutaneously, intramuscularly, or intravenously. Subcutaneous injections are infrequently used, as they have painful after effects and sometimes cause unpleasant reactions, both local and general. The intramuscular injection is the method generally used for recent cases, and intravenously for neurosyphilis. The drug may be given intramuscularly almost with impunity, provided it is given in sufficiently high concentration (20 per cent). The drug, however, is also well tolerated when given intravenously. Its toxicity has been shown to be much lower than that of either arsphenamine or neoarsphenamine.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Sulpharsphenamine is being used more constantly at the Mayo Clinic. While, of course, it is as yet too early for them to speak definitely, the investigators at the Mayo Clinic are of the opinion that it is probably the equal of arsphenamine in ordinary cases and superior to it in lues of the central nervous system. It is regarded as being much superior to neoarsphenamine. This opinion is expressed after about one year's clinical use and serological observation. The clinic will probably not care to express a definite opinion regarding this drug until they have been able to obtain a sufficient number of "five-year cases" and determine the permanency of apparent cures. Sulpharsphenamine is regarded at the clinic as being especially well adapted for use by the Navy because of its ease of preparation and injection, its stability and low toxicity, and the clinical and serological results so far obtained.

Sulpharsphenamine is administered at the clinic in doses of 0.4 to 0.8 gram, intramuscularly in recent cases and intravenously in neurosyphilis. The average does is 0.4 gram intramuscularly and 0.6 to 0.8 gram intravenously. Intramuscularly, it is usually given in the buttock in 20 per cent solution. Intravenously, a similar strength solution in normal saline is used. In more susceptible individuals, the dose is divided and given in two injections, one immediately following the other, in each buttock. While a certain amount of reaction follows these injections, varying in degree with the individual, the drug is regarded at the clinic as being of low toxicity. The reactions are usually negligible and no permanent bad effects have followed its use. With very rare exceptions, the patient neither goes to bed nor requires any special care. Serological tests of the spinal fluid are begun after the third injection.

A complete course of treatment, as given at the clinic, lasts about one year, irrespective of clinical results or serological findings. The treatment by intramuscular injections is accompanied by mercury rubs.

The method of treatment is as follows:

First course.—

One injection every third day for three doses.
One injection every five days for five doses.
Two-month interval.

Second, third, and fourth courses.—

One injection every five days for eight doses.
Two-month interval between each course.

After the third injection of the first course and at the beginning of the subsequent courses, mercury rubs are given daily, with an interval every seventh day, for 40 rubs. Printed directions for taking these rubs are given the patient and are quoted at the end of this paper. What is called a "clean rub" is given: that is, an ointment

Digitized by Google Original from UNIVERSITY OF MICHIGAN

containing about 33⅓ per cent of mercury is used, rubbed in hard for 30 minutes, and then washed with benzene. This removes the excess ointment and makes the rub much more agreeable to the patient. It is desired that the patient receive from 30 to 40 grains of mercury at each rub.

Because of the usually acute character of cases in the Navy, it has been suggested at the clinic that in the Navy, the interval between the first and second course of injections be made six weeks instead of two months. In old luetic patients, a four-month interval may be used between courses.

Neural reactions are found to be comparatively frequent following injections, and in these the interval period between courses should be reduced.

It is believed that the method of mercurial rubs used at the clinic could readily be adapted to use in the Navy, a corner of the sick bay being used for the purpose and a hospital corpsman detailed to supervise the rubs.

The urine is examined every one or two weeks at the clinic in all cases receiving the above treatment, especially for casts and red blood cells. But little attention is paid to albumen. In case casts or red blood cells appear in any great quantity, the rubs are temporarily discontinued and the patient given alkaline and eliminative treatment. No persistent kidney complications have been encountered.

The most frequent and most troublesome complications so far found at the clinic has been stomatitis. Endeavor is made to avoid this by having the patient brush his teeth three times daily and wipe the gums morning and evening with a solution of kino and myrrh. In addition, endeavor is made to avoid undue acidity by diet, and the patient is instructed not to eat acid foods, such as pickles, apples, plums, oranges, lemons, grapefruit, cherries, peaches, and grapes. Nor are they permitted to use vinegar or to eat any salad dressing containing vinegar or lemon juice. Any coexisting pyorrhea should receive careful dental treatment. Diet and necessary dental treatment are regarded as being especially valuable phophylactic measures against stomatitis.

MAYO CLINIC INSTRUCTIONS TO PATIENTS FOR TAKING CLEAN RUBS

The medicine used in taking rubs enters the body through the skin.

It must never be taken by mouth or placed where children can reach it.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

While this kind of treatment may not be pleasant, it is by all odds the best form that you can use yourself, and much better for your case than pills.

Rubs are usually given in courses of forty. They are to be taken in sets of six rubs weekly.

A rub is taken each night for six nights in succession, and on the seventh a thorough cleansing bath with soap and hot water is taken instead of a rub.

Underclothing, night clothing, etc., may be changed whenever desired.

The rub is taken on one of four or preferably six different places, a different place being used each night, as follows:

First night.—Right side of chest, in front of and below the armpit.

Second night.—Left side of the chest, in front of and below the armpit.

Third night.—Right side of abdomen and flank.

Fourth night.—Left side of abdomen and flank.

Fifth and sixth nights.—Inner surface of right and left thighs, under surface of upper arms, or the back.

Wash the skin with soap and water and dry with medicated alcohol before beginning to rub.

If there is much hair on the body call it to the physician's attention and ask him to tell you where to rub.

Rub for at least 30 minutes by the clock.

Rub firmly but not roughly, using the flat of the hand. The skin should not be sore after the rub.

Rub in a space about 18 inches in diameter.

Remove what ointment remains on the skin with a soft cloth and the remaining grayish stain with a pledget of cotton moistened with benzene.

This will leave the skin clean and the usual objection to rubs will thus be eliminated.

Do not allow yourself to miss or skip rubs during a course without your physician's orders or permission.

It is advisable to have your urine examined at least once in two weeks while taking the rubs.

Should your mouth become definitely sore, or diarrhea develop, stop the rubs and report to your physician for further advice.

LEPROSY IN THE HAWAIIAN ISLANDS

By J. M. McCants, Lieutenant, Medical Corps, United States Navy

As a basis for the following article I have consulted in person the medical authorities at the Kalihi Hospital, Honolulu, Hawaii, and

Digitized by Google Original from UNIVERSITY OF MICHIGAN

have reviewed recent literature on the subject submitted to me by the office of the Territorial board of health. Only the treatment of leprosy will be taken up in detail. Other phases of the subject will be touched upon as they seem to be of interest in the light of recent knowledge.

ETIOLOGY

1. The specific organism is the bacillus lepræ.

2. *Race.*—The vast majority of all lepers here are found in the Hawaiian or part-Hawaiian race. There seems to be some inherent predisposition to leprosy on the part of the Hawaiian race, but other factors are to be considered:

(*a*) The Hawaiians have long lived here and have had long exposure to this disease.

(*b*) The family method of sitting around a bowl of poi from which each member eats with his fingers—lepers and all—is an important point.

(*c*) The Hawaiians are heavy drinkers, and liquor is said to be a great predisposing cause of leprosy.

The following table illustrates the nativity of apprehended lepers:

Year	Hawaiian	Part Hawaiian	Chinese	Portuguese	Japanese	European	American	Pacific Islanders	Korean	Porto Rican	Total
1901	61	14	5	0	3	1	0	1	0	1	86
1902	62	10	7	2	0	3	2	1	0	0	87
1903	89	8	9	6	3	0	4	0	0	2	121
1904	64	12	8	5	4	0	2	1	0	0	96
1905	68	11	4	1	3	1	1	0	0	1	90
1906	34	6	7	2	1	1	1	1	1	0	54
1907	65	10	4	6	4	2	1	1	0	1	94
1908	15	2	1	2	1	2	0	0	0	0	23
1909	51	7	1	3	0	0	2	0	2	0	66
1910	22	11	2	6	1	3	0	1	1	0	47
1911	71	18	4	7	6	0	0	1	2	0	109
1912	89	28	6	9	2	0	0	2	0	2	138
1913	29	10	3	3	1	1	0	0	2	0	49
Total	720	147	61	52	29	14	13	9	8	7	1,060

3. *Sex.*—Contrary to the statements given by most authors that leprosy occurs in the proportion of 2 to 1 or 3 to 2 in favor of the male, it is the opinion here that the two sexes are equally susceptible, and that the above proportion is more apparent than real. The following reasons are given:

(*a*) Although more males are diagnosed and treated as lepers, it is said that the female is harder to apprehend, due perhaps to her seclusion in the home.

(*b*) All other races here except the Hawaiian have a large proportion of males.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

4. *Age.*—Leprosy is a disease of youth and early adult life, although no age is exempt. About 40 per cent of lepers contract the disease under the age of 21.

5. *Method of contagion.*—The disease is so chronic and its onset so insidious that the method of contagion is not so readily understood. The ingestion method is considered the most plausible, although one local authority with whom I conversed was in favor of the inhalation route.

CLINICAL FORMS OF LEPROSY

The three familiar types of leprosy are still used in diagnosis, namely, the nodular type, the anesthetic or nerve type, and the mixed type. It seems to be the opinion of the medical profession as a whole that the nodular type predominates, but it is said that careful examination will reveal the mixed type to constitute the greatest number of cases.

DIAGNOSIS

This will be referred to under the Territorial laws. The actual procedure is as follows:

1. *Physical examination.*—The suspect is stripped and given a thorough physical examination, particular care being given to the detection of any signs of leprosy. The history of the case is also noted.

2. A bacteriological examination follows the physical examination. This consists of making a smear from any lesion or even the normal mucous membrane of the nose and at least two other smears taken from other parts of the body (e. g., nodules on the ear lobes).

The nasal smear is made by gently curretting the lesion or membrane with a sharp instrument and smearing the material obtained on a new, clean glass slide. The other smears are made as follows: Pick up a nodule (of the ear for instance) between the thumb and index finger of the left hand and gently squeeze. A finger of the right hand is now used to make the nodule bloodless by a process of stroking. With the exsanguinated nodule still held firmly with the fingers of the left hand incise with a Gillette razor blade. The cut surface is now gently scraped with the corner of the same instrument, only enough blood being allowed to mix with the serum obtained to make the microscopic field easy to find. This material is smeared on glass slides as mentioned above. The smears are now labeled, fixed, stained by an acid-fast method, and examined for acid-fast-bacilli.

In positive cases the organisms are as a rule numerous and easy to find. In many cases, however, and this is especially true of the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

nerve type, the organisms are difficult if not impossible to find. If the history, symptoms, and signs warrant it, a diagnosis of leprosy is made in the absence of positive laboratory findings.

TREATMENT

The territorial laws in regard to the apprehension of lepers are as follows:

First. The board of examining physicians shall consist of five physicians, appointed by the board of health, one of whom shall be the bacteriologist of the board of health, and another of whom shall be skilled in the use of the microscope for the discovery of the bacilli of leprosy, and be designated as the assistant bacteriologist.

Second. The bacteriologist of the board of health shall promptly make a preliminary examination of each person coming voluntarily or otherwise under the control of the board of health under the suspicion of or being alleged a leper. At said preliminary examination should the bacteriologist fail to find the bacilli of leprosy present within such person, then said person shall immediately be discharged and returned to his home at the expense of the board of health. Should the bacillus of leprosy be found present within such person, said person should be held for examination at the next meeting or the full board of examining physicians.

Third. Each person so held shall be given one week's notice of the meeting of the board of examining physicians.

Fourth. Each person so held shall have the privilege of being represented at said meeting of the board of examining physicians, by a physician selected and employed by said person. Should said physician object to the decision of the board of examining physicians he shall do so in writing, stating his reasons therefor. Upon receipt of such written objection the president of the board of health shall direct both bacteriologists of the board of examining physicians to make a reexamination of such person at which reexamination said physician may be present. They shall report to the president of the board of health their findings, and he shall transmit a copy of same to the physician representing such person. Should both the bacteriologists find the bacilli of leprosy to be present within such person the decree of the board of examiners shall be final; otherwise such person shall be treated as a "suspect," and shall be required to report for further examination as the board may direct.

Fifth. All persons examined by the board of examiners shall be placed in one of the following classifications, viz: Not a leper, suspect, leper.

If, in the opinion of three or more of the examiners, any person examined is a "suspect," he or she shall be so declared.

If, in the opinion of three only of the examiners, any person is a "leper," he or she shall be classed as a "suspect" with the condition that he or she report to the examining board as it may direct for reexamination.

If, in the opinion of four or more of the examiners, any person examined is a leper he or she shall be so declared.

NOTE.—"Should any patient require and request medical counsel the board will furnish same free of cost to the patient, if the case justifies the procedure. * * *" (Quoted from the booklet, "The Molokai Settlement," issued by the Board of Health of the Territory of Hawaii.)

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Since 1909 the apprehension and detention of lepers have been conducted under a Territorial law, which, in addition to certain administrative sections, contains the following:

Notification.—Every person who knows, or has reason to believe, that he, or any other person, not already under the care or the control of the board of health, is a leper, shall forthwith report to the board or its authorized agent that fact and such other information relating thereto as he may have and the board may require.

Examination.—Any person so reported, or otherwise believed to be a leper, may be examined at any time and place and by any physician or physicians that may be agreed upon by him and the board or its agent. The board or its agent may, however, instead request such person to appear at a designated place and time not less than five days thereafter and then and there to submit to an examination by a designated physician for the purpose of ascertaining whether such person is a leper. If, however, such person prefers such examination to be made by more than one physician, he may so notify the board or its agent at any time before the time so designated and may at the same time, or within such further time as the board or its agent may allow, designate to the board or its agent one licensed physician; in which case the board or its agent shall within five days thereafter designate to such physician a second licensed physician; and the two physicians so designated shall within five days thereafter designate to the board or its agent a third licensed physician, and if they fail to do so, such third physician shall be designated by the circuit judge of the circuit in which the examination is to be held, and in case the person shall fail to designate a physician within the time allowed, all three physicians shall be designated by such judge; notice of any such designation or designations by a judge shall be given forthwith to such person and to the board or its agent; when the three physicians have been so designated such examination shall be made by them or a majority of them at a convenient time and place designated by the board or its agent, reasonable notice of which shall have been given by the board or its agent to such person and to such physicians.

The physician or physicians who make the examination shall report to the board or its agent whether in his or their opinion such person is a leper. If such person is under the age of sixteen years, his parent or guardian, if any, may exercise such preference and thereafter represent such person as far as may be for the purpose of this section. If, upon such examination, such person is found not to be a leper, the board shall furnish him upon request a certificate setting forth such facts, the date of examination, and the name or names of the physician or physicians making the examination.

It is said that the lepers of Hawaii are now fairly easy to apprehend, many of them coming voluntarily for aid. They are anxious to be cured, apparently having great faith in the treatment at present in vogue.

All cases of leprosy are given institutional treatment. The following institutions are used for this purpose:

(*a*) The Kalihi Hospital is the receiving hospital for all lepers apprehended. Here the diagnosis is established or previous diagnoses of leprosy are confirmed. The milder cases are retained at this hospital for treatment, but the more serious ones are transferred

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to the leper settlement at Molokai. At present there are 207 lepers at this hospital.

(*b*) The Molokai settlement is the largest institution for the treatment of lepers. The more serious cases and those obviously requiring long hospitalization and segregation are treated here. At the end of the fiscal year 1922 there were 439 lepers at this institution. The settlement consists principally of the main hospital and of separate homes for boys and girls. In addition there are homes for nonleper boys and girls, the children of leper parents. Fortunately few children are born in the settlement. Those that are born are immediately taken away from their mothers, placed in one of these nonleper homes, and are said almost never to develop leprosy. Later they are removed from the institution by healthy relatives or are adopted.

In regard to the general treatment of leprosy I shall quote from J. T. MacDonald's article on "The treatment of leprosy," published in the Public Health Reports of August 20, 1920:

"As a prerequisite to, and combined with, specific medication, especial importance is placed upon the general welfare of the patients. The food is of good quality, ample, well cooked, and well served in cheery dining rooms. In the dormitories the patients care for their own rooms and are held to account for neatness and cleanliness, both in person and surroundings. Idleness is discouraged and meditative moping is not permitted. The adult males find occupation and diversion in vegetable and flower gardening, care of the livestock, repairs and painting, upkeep of lawns, etc., and the women busy themselves with the usual activities of home life, except the cooking and serving of meals. The younger boys and girls attend school a few hours daily under a teacher patient, and behave during the rest of the time precisely as children do everywhere. The entire community plays tennis, baseball, volley ball, basket ball, croquet, billiards, etc., and in the evenings, dances and movies in the assembly hall are frequent. The patients have their own stringed orchestra and singing club and every few weeks stage a play or a concert with costumes of their own design and making. There is a spirit of good cheer and hopefulness, each one determined to effect a cure. Cases which improve to the point where the clinical signs have disappeared and the bacillus can no longer be demonstrated are recommended for parole by the physician in charge. A board of three physicians is appointed by the board of health, and this board passes on the advisability of allowing the patient to go out, as no longer a menace to the public health. Paroled patients are required to report at stated intervals.

"The care received, the spectacle of fellow patients being paroled, and the general atmosphere of the hospital lead to a high state of morale; such effects on physiological tone as may be due to mental condition are highly favorable.

"On the arrival of new patients at the hospital, after their official examination and formal admission, our first care is to give them a thorough examination to learn what they need to improve their

Digitized by Google Original from UNIVERSITY OF MICHIGAN

general condition. For instance, those who seem to be badly nourished and anemic are immediately put upon some standard tonic, such as a tablet of iron, arsenious acid, and strychnine. We find that they quickly respond to the improved surroundings, good care and treatment, by improved appetite, gain in weight, etc. We believe this puts them in a better state to receive and assimilate the remedies directed specifically to the cure of the disease. Others, again, enter with scabies, which is promptly relieved by sulphur ointment applied in the usual way. Ulcers respond kindly to appropriate treatment and heal in a few weeks. Briefly, our object is to put and maintain every patient in as good general health as possible.

"Of the long list of drugs and remedies used especially against leprosy by various authorities, we have nothing derogatory to state. The writers have great faith in strychnine, recommended by Dyer and Hopkins, of New Orleans, as we certainly have had good results from its constant use, especially in nerve cases. Arsenious acid, gurjun oil, and several others of the old-time remedies, so far as tried have maintained their good reputation in our hands, and we believe have done good."

Strychnine is said to be especially valuable in the treatment of nerve leprosy. During the segregation period intercurrent diseases must of necessity be treated also. Surgical procedures are often resorted to for ulcers, useless fingers, scattered nodules, etc. When a patient is clinically well and has received three negative bacteriological examinations at three-months intervals, he is paroled as being in a nonmenace status. Some are anxious to see the world again, but many are reluctant about leaving and, like the prisoner of Chillon, gain their freedom "with a sigh."

The recently discovered chaulmoogra-oil derivatives appear to be a specific in leprosy.

Chaulmoogra oil is expressed cold from the nuts of a native tree of India. There are several varieties of this tree, the best one being known as *Taraktogenos kurzii*. This oil is one of the few members of the group of fatty oils which have physiological action in addition to their nutritive value. The oil is peculiar in that it is dextrorotatory, having a specific rotation of plus 50°. A new series of fatty acids represented by the members Chaulmoogric acid, $C_{18}H_{32}O_3$, and hydrocarpic acid, $C_{16}H_{28}O_2$, has been discovered in this oil.

Chaulmoogra oil has been used in its crude state in the treatment of leprosy with apparently beneficial results. This led to a great deal of work in an endeavor to isolate the active principle. The fatty acids themselves have been isolated, but since they are solids they can not be used for hypodermic injection. It was found, therefore, that the ethyl esters of the various members of the fatty acid series

Digitized by Google Original from UNIVERSITY OF MICHIGAN

were light, thin oils that could be easily administered with a hypodermic syringe. Four of these esters have been used separately on different series of patients with beneficial results in each series, showing that the active principle still remains unisolated and apparently unaffected by the chemical process gone through in their preparation. Iodine has been used in chemical combination with the esters, but it does not seem to improve their therapeutic value other than the fact that it lessens the amount of local irritation following an injection.

It is now the opinion of the leprosy authorities in Hawaii that the best form of injection to use is the mixed ethyl esters of the entire fatty acid series of chaulmoogra oil plus 1 per cent iodine. Neither do they think that the oral administration of the drug is of material value as an additional treatment.

The technique of administration is as follows: All-glass, 20 c. c. Luer syringes and 20-gauge steel needles are sterilized in the autoclave at 15 pounds' pressure for one-half to one hour. The mixed ethyl esters are sterilized the same way in cotton-plugged Ehrlenmeyer flasks. A syringe is filled with the preparation and used for several patients, it only being necessary to change needles for each patient. The injections are given intramuscularly in the upper outer quadrant of the gluteal region at weekly intervals, alternating between the two sides of the buttocks. The initial dose is 1 c. c. and is gradually increased to 4 or 5 c. c. according to the local reaction, age, and weight of the patient (e. g., children up to 75 pounds in weight get 2 c. c., 75 to 100 pounds get 3 c. c., and above this weight patients get 4 to 5 c. c. as the maximum dose). The continuous method of treatment is employed.

RESULTS OF TREATMENT AND REMARKS

1. Practically all early cases show marked improvement to an apparent cure.

2. Many advanced cases show improvement.

3. About a third of all cases treated are sufficiently improved to be paroled; that is, an apparent cure.

4. Since 1912 of 264 lepers that were paroled 40 have returned with a recurrence of the disease, and 22 have died from other causes.

5. Little improvement is noted prior to three months' treatment.

6. Cases once paroled report at stated intervals for examination, but do not receive specific treatment. It is being considered advisable to continue the specific treatment for a period of time on paroled cases to make certain of the cure.

7. A local abscess occasionally forms after an injection which has the nature of a "cold" abscess, but it readily heals on incision and drainage.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

8. Leprosy fever frequently results from injections, and this is supposed to be due to liberated toxins from destroyed bacilli. It is only necessary to put the patient to bed for a few days and to discontinue the injections for a short while.

9. Specific treatment not only degenerates the specific organisms as evidenced by their granular appearance but the organisms actually disappear from the lesions, which also fade away with scar formation as the only result.

10. The treatment seems to do good in all types of leprosy, but the best results are seen in the nodular and mixed types.

11. Cowpox vaccination on a leper causes a marked exacerbation of the disease.

12. It is believed that early detection of lepers with early and thorough treatment will effect a cure. While it is not certain that a cure can be effected, it is certain that an active principle exists in chaulmoogra oil which exerts a profound effect on the control of the disease.

13. The actual cost of preparing the ethyl esters of chaulmoogra oil is about $12 per liter. It can be obtained for the naval service in special instances by arrangements made through the Surgeon General of the Public Health Service. The oil is stable and presumably will retain its potency for many months. This phase of the subject, however, is being investigated at present.

14. In addition to the perusal of leprosy in standard textbooks on tropical diseases I believe that a careful reading of the following reprints will give one the best and most recent knowledge of leprosy:

"Preparation of chaulmoogra-oil derivatives for the treatment of leprosy" by Arthur L. Dean and Richard Wrenshall. Reprint No. 756 from the Public Health Reports.

"Treatment of leprosy with the Dean derivatives of chaulmoogra oil," by J. T. MacDonald. A Public Health publication.

"The treatment of leprosy with especial reference to some new chaulmoogra-oil derivatives," by J. T. MacDonald and A. L. Dean. Reprint from Public Health Reports, No. 607, of August 20, 1920.

"Studies upon leprosy." Public Health Bulletin No. 130, December, 1922. By H. E. Hasseltine, surgeon, United States Public Health Service.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

CLINICAL NOTES

THE KONDOLEON OPERATION AND FILARIASIS

By H. M. STENHOUSE, Lieutenant Commander, Medical Corps, United States Navy

Elephantiasis is not a disease limited to the Tropics. But its great prevalence in certain tropical countries leads one to associate the condition with such a climate. Matas and Sistrunk in the United States have popularized the method of Kondoleon for the reestablishment of lympathic drainage. Sistrunk[1] especially, maintains that the condition is the result of a streptococcus infection rather than of a filarial.

We are not prepared to say that there are cases caused by filaria. However, there is a certain widespread belief among physicians that Elephantiasis Arabum is a sequel to Filariasis Bancrofti.[2] [3]

On the island of Santa Cruz in the Caribbean elephantiasis and filarial infections are both common. Ten per cent of the blood smears examined during the past year in the municipal laboratory revealed Filaria Bancrofti. A Danish physician, Doctor Neumann,[4] based a thesis on elephantiasis as it existed in Santa Cruz. He found that about 6 per cent of the population has elephantiasis.

If there is an elephantiasis of filarial origin we have debated the advisability of operation in these cases. Nature has built up a protective wall. The progress of lymph, parasites, or even the cutting edge of a knife is arrested by the density of the tissue.

The absence of filarial embryos from the blood in most cases speaks for the efficiency of the protective mechanism. Should we break down this defensive wall? Should we open up new avenues by which injurious parasites might again enter the general circulation?

Our experience indicates that the usual places of abode of the adult worm in filariasis is in the femoral and popliteal glands.

[1] Sistrunk, W. E. Journal American Medical Association, vol. 71, Sept. 7, 1918, p. 800.

[2] Stitt, E. R. Diagnostics and Treatments of Tropical Diseases. 2d edition, 1917, p. 311. P. Blakiston.

[3] Anders, J. M. Practice of Medicine. 14th edition, 1921, p. 371. W. B. Saunders Co.

[4] Neumann, L. Symptomalologien Elephantiasis Arabum Pedum Oplyst ved Iagttagelser Paa St. Croix. Afhandling for Doctorgraden I Medicinen af L. Neumann, offentlig Laege i Christiansted. Kjøbenhavn. August Bangs Boghandel. Triers Bogtrykkeri (H. J. Schov), 1881.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

This leaves a goodly portion of fibrotic tissue between the Kondoleon field of operation and the glands where the adult parasite has become enmeshed. Following the operation there ensues a period of partial absorption of this fibro-gelatinous tissue but not complete.

In filaria blood-negative cases we believe that the parasite has not only been surrounded but that in all probability it is eventually destroyed.

We operated on two cases by the Kondoleon method for elephantiasis of the leg, one (a male, age 34) in February, 1923, the other (a female, age 31) in April, 1923, both natives of St. Croix. Both patients were carefully examined prior to the operation and observed four to eight weeks afterward. The result in each case was satisfactory. Repeated blood examinations failed to show filarial embryos before or after operation. There was no evidence of any extension of the process or of reinfection as a result of the opening up of new lymphatic channels. Each patient has been seen at intervals since then and both have been in good health. They have done their usual work as porter and washer.

Since then other cases have been operated upon, and we have not yet seen any injurious effects from the procedure (Kondoleon operation) advocated for elephantiasis in the Temperate Zone. We are convinced of the beneficial effect to be derived. But it is important to emphasize that the youthful contour can not be restored. To prevent further enlargement of the affected limb is our goal.

MAXILLARY SINUSITIS OF DENTAL ORIGIN

By E. B. Howell, Lieutenant, Dental Corps, United States Navy

Probably one of the most stubborn conditions with which the dental surgeon must contend in the treatment of focal infections about the mouth is that of maxillary sinusitis. In fact, it is comparatively recent that any well-defined outline of treatment has been tabulated, whereby the accessory sinuses of the face may be dealt with by the cooperation of the rhinologist, the general surgeon, and the dentist.

Of all these sinuses, the antrum is the one most frequently diseased because of its close proximity to the nasal passages, and the intimate relation of its floor to the roots of the teeth. The number of cases of dental origin, however, seem to vary according to the opinions of different authors. By striking an average, it appears that approximately 25 per cent of all cases of antral empyema is directly due to dental infection, and it is with these cases which we must deal.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Although Blair states, "It is becoming more and more recognized that the rhinologist, with his special facilities for diagnosis and for doing nasal operations, is the one most fitted for the treatment of at least those cases which are secondary to a nasal infection," it is my contention that chronic cases of dental origin should also be referred to him after the antrum has been entered from the mouth, for either temporary or permanent intranasal drainage. With the passing of the obturator, drainage tubes, plugs, and other contrivances, and the substitution of the sutured flap after entry or curettement, it is evident that this should be followed by intranasal drainage in all instances except possibly in a very acute case.

Upon presentation of an acute condition where diagnosis has been made, and the etiological factor found to be an abscessed tooth which projects into the floor of the antrum, the extraction of the tooth will necessarily form a natural drain for the seropurulent fluid. Drains may be inserted and the antrum irrigated twice daily with a normal saline solution. Usually in 10 or 15 days or when all signs of suppuration have disappeared, the drains can be removed and healing will take place. It is of the utmost importance, however, to make certain that the condition is acute, for if this procedure is followed in a chronic case, the aperture will fail to close and a permanent fistula will result.

When chronic suppuration of the antrum has resulted from an infected tooth, naturally the first procedure is to extract the tooth. If the diagnosis has been made from a Röntgenological report which showed an area of increased density in the affected antrum, and curettement is indicated, complete anesthesia of this region should be obtained. A conductive injection at the infraorbital foramen will anesthetize the anterior superior dental nerves supplying the antrum, and one at the maxillary tuberosity will reach the posterior superior dental nerves supplying the affected tooth. If entrance is to be made through the canine fossa, 1 c. c. of the solution used should be injected in that area. The infected tooth is then extracted, care being taken to preserve the periosteum and surrounding soft tissue by first raising it up with a periostial elevator. The opening made by the tooth socket is then enlarged in the direction of the greatest diameter of the floor and as far as adjacent structures will permit. Curettement of all diseased tissue should follow. Polypi, denuded bone, and cysts may be encountered and should be removed, instituting the greatest of caution, however, to preserve the healthy mucous membrane which normally is covered with ciliated epithelium. In some cases complete destruction of this membrane will necessitate its removal, but wherever possible its retention is desired in order to insure against the accumulation of scar tissue. The

Digitized by Google Original from UNIVERSITY OF MICHIGAN

cavity is then irrigated with normal saline solution until every vestige of infected material has been dissipated.

The aperture is now closed, by bringing the soft tissues together so that they approximate each other, and sutured. This may be done by resecting the alveolus high up on either side of the opening and retracting the flaps from within downward so that they may overlap each other if necessary. Fine silkworm gut may then be selected and the flaps sutured in a manner that will insure complete closure of the cavity.

The case should then be referred to the rhinologist for postoperative treatment by intranasal drainage through the normal ostium. If the condition still persists, a radical operation whereby permanent intranasal drainage is established, will probably result.

The following case offers absolute condemnation against any attempt to drain through the mouth in chronic suppuration of the antrum:

The patient gave a history of root amputation of an upper right first bicuspid and a subsequent drainage operation just above this area. Upon examination clinically, and with the aid of Röntgenograms, the antrum was found to be badly infected and a fistula the size of a quill issued from an area about one-half inch above the bicuspid tooth. The handle of a mouth mirror could be passed directly into the antrum through this opening. By irrigating under pressure, thick pus could readily be expelled together with some lighter fluid. Apparently the case had been considered acute and an opening was made which resulted in a permanent fistula which had been draining for five months.

The soft tissues and periostium supporting the tooth together with that surrounding the fistula was carefully raised with a periosteotome and the tooth extracted. The alveolus bridging the space between the fistula and root socket was chiseled away and all diseased bone removed. The membrane lining the fistula was retracted down into the mouth by making two incisions on the mesial and distal sides of the opening and a circular incision at the floor of the antrum. Two flaps are thus obtained. The antrum was then curetted and irrigated and the flaps sutured with fine silkworm gut. The case was then referred to the rhinologist who established a temporary intranasal drainage by puncturing the normal ostium and irrigating with normal saline solution. At the expiration of 15 days irrigation was discontinued and all signs of suppuration had disappeared. Four months have elapsed and not the slighest suspicion of a recurrence has been evidenced as yet.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

REPORT OF A CASE OF LARGE "SOLITARY" TUBERCULOUS ABSCESS OF LIVER

By L. F. Robinson, Lieutenant, Medical Corps, United States Naval Reserve Force

The following case is reported because tuberculosis of the liver is so uncommon. When found it is usually a part of a generalized miliary tuberculosis, the infection finding entrance into the liver through the portal circulation, however it may enter by way of the hepatic artery or the lymphatics. (Mayo.) The hepatitis set up is most frequently characterized by the formation of miliary tubercles which may be within or between the liver lobules, or in the walls of the bile ducts. The microscopic examination shows considerable variation in the structure of the tubercles in different cases, as well as in the same liver. The tubercles may vary from a size too small to be seen by the naked eye to the size of a walnut and larger. The so-called solitary forms are the result of several tubercles massed together. In the larger forms there is usually more or less cheesy degeneration and a destruction of liver cells. The liver cells at the base of the tubercles are destroyed and the interstitial tissues are either destroyed or merged into the tubercle masses. The surrounding cells undergo coagulation necrosis and the adjoining tissue may become infiltrated with spheroidal cells. In the cheesy masses may be found tubercle bacilli. (Delafield and Prudden.)

Clinically the condition is rarely recognized. A few cases have been reported in which a solitary abscess has existed and after evacuation by operation the patient has recovered and remained well. Mayo Robson reports a case in which two years after the operation the patient was in excellent health.

Mayo recommends by way of treatment evacuation of abscess, careful sponging out of the caseating mass and the application of 1–500 solution of tincture of iodine or of pure carbolic acid followed by alcohol. The cavity should them be dried and dusted with sterile iodoform, or 1 to 2 drams of sterile-iodoform emulsion in glycerine may be introduced and the wound closed without drainage.

Case report.—Case 1177. Admitted to hospital May 9, 1921; diagnosis, tuberculosis of liver; Dominican farmer, age 38; family history negative.

Past history.—Patient always has been in good health. In 1918 he began to notice a growth in right upper abdomen, but aside from a slight tenderness this caused no trouble. The growth gradually increased in size to its present dimensions. Digestion always good, bowels regular. Never took cold easily nor suffered from coughs. Denies yaws, syphilis, and gonorrhea.

Present complaint.—Enjoyed usual good health up until six weeks prior to admission, when he had a severe hemorrhage from nose which

Digitized by Google Original from UNIVERSITY OF MICHIGAN

made him very weak. This was the first time he had ever had bleeding from the nose. Has had several attacks of nose bleeding since of more or less severe type, and for past few days there has been more or less constant bleeding from both nares. He feels all right, has good appetite and eats heartily, bowels regular. It was evident that aside from the weakness caused by great loss of blood the patient was free of symptoms.

Physical examination. — Temperature, 98; pulse, 120, weak, regular; respiration, 26; nutrition fairly good. Conjunctiva and skin, icteroid to slight degree. Chest negative. Heart: Apex felt in fifth interspace 2½ inches from midsternal line; soft systolic blow at apex not transmitted. Abdomen: Marked bulging of epigastrium extending to umbilicus; enlargement is continuous with liver dullness, presenting a rotund elevation from surrounding skin of about 1½ inches and follows abdominal skin during respiration; liver dullness extended from costal border in axillary line to umbilicus; spleen not palpable; lower abdomen soft and free. Patient complained of some tenderness on deep palpation of mass, but upon slight palpation felt nothing; superficial glands not palpable; reflexes prompt. Genitourinary system negative; repeated urine examination negative; blood examination negative.

Progress record.—For the first few days after admission the patient lost considerable blood in spite of nasal packing and usual remedial measures. In the week prior to June 3 had no bleeding from nose and felt much stronger. He had been receiving 6 grams of calcium chloride daily when on this date he had a severe nosebleed, losing a large amount of blood. In spite of tight packing of both nostrils there continued a slight oozing. On June 8 after it appeared that the patient would become exsanguinated unless something was done, an exploratory operation was performed.

Operations.—June 8, 1921. After usual preparation, a 4-inch incision was made over the mass. Upon separation of the rectal fibers the posterior sheath was found injected and adherent. The underlying peritoneum was about three-eighths of an inch thick, vascular and friable. Careful dissection through peritoneum revealed, as had been apparent, firm adhesions between mass and peritoneum. Mass was found to be of a yellowish white cheesy character and appeared continuous with liver. Dissection of deeper structure of mass for 2 inches revealed same cheesy-like tissue and a notable absence of blood vessels.

Unfortunately because of fall of blood pressure it was necessary to discontinue the anesthetic. The abdomen was closed with through-and-through sutures; no drainage. Patient died 10 hours later.

Necropsy.—Chest not examined. Abdomen: Liver filled whole right upper abdomen from a line drawn from umbilicus to costal

Digitized by Google Original from UNIVERSITY OF MICHIGAN

border at midaxillary line, surface smooth, right lobe adherent to anterior wall in an area 3 by 3 inches. Liver and mass removed together; liver weighed 3,430 grams. Tumor after it was shelled out of liver substance weighed 750 grams. The peritoneum other than adherent portion appeared normal. Stomach free, spleen free. Bowel and appendix free. Lymphatic normal.

Microscopic examination.—(Made by Naval Medical School.) Tumor mass composed of inflammatory tissue undergoing caseation. Epitheleal and giant cells present. Diagnosis, tuberculosis.

A CASE OF FAR-ADVANCED TUBERCULOSIS UNSUCCESSFULLY TREATED BY ARTIFICIAL PNEUMOTHORAX, COMPLICATED BY PYO-PNEUMOTHORAX AND TREATMENT BY THORACOPLASTY

By E. W. Gutzmer, Lieutenant (junior grade), Medical Corps, United States Navy

The patient was brought into hospital November 6, 1923, on stretcher, complaining of high fever and cough, from Liberty, N. Y., where he had received an artificial pneumothorax on left side October 17, 1923, following which he developed pus on this side, and had two aspirations done, the first being thin and watery, and the second thick and creamy pus.

In October, 1919, patient had an attack of pleurisy and was in a private hospital for a few days, after which he went home and remained nine months, but could not do much work. In 1921 a diagnosis of tuberculosis was made. He worked part time and rested part time.

September 24, 1922, he started spitting up blood, and in the following October went to a tuberculosis sanitarium, Liberty, N. Y., where he stayed five months. He was then taken up by Veterans' Bureau and sent back to Liberty, N. Y., where he remained until he was sent to this hospital.

Past clinical history.—Measles and typhoid fever in childhood. Pleurisy in left chest in 1919. Denies venereal disease.

Family history.—Father living and in good health. Mother died at 40, of typhoid. Three brothers and three sisters living and well; none dead. No heredity diseases.

Army history.—Enlisted in July, 1918; discharged May 28, 1919. On sick list 10 days in February, 1919, with a cold. No other sickness.

Physical examination.—On entrance into hospital patient was a very sick-looking man; the right cheek flushed, and respirations very rapid.

The chest expanded about normally, though the left side did not to much extent; only a slight movement was noticed as patient lay in bed.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Percussion note.—Impaired over both chests, hyperresonance anteriorly over left chest and dullness to flatness posteriorly. Right side of chest shows an impaired note, but not as much as on left.

Palpations.—Increased tactile fremitus more on left. Patient's condition was such that a thorough examination of chest was inadvisable.

Auscultation.—Breath sounds are almost absent over left chest. Very harsh sounds over right; few subcrepitant rales heard over right chest, both anterior and posterior.

Heart.—Slightly enlarged; rate rapid, 108; otherwise normal.

Abdomen.—Soft and palpable. No masses or areas of tenderness felt.

Extremities.—Negative except for clubbing of fingers.

On November 16, 1923, a diagnosis of pyopneumothorax was made. X ray on November 6, 1923, showed marked enlargement of heart. Indistinct left border. Infiltration in right lung. Hazy on left side, probably due to pneumothorax and contracted lungs. On November 2, 1923, 500 c. c. of pus were aspirated from left chest. A surgical consultation was requested. A thoracotomy under local anesthesia was recommended, whereupon he was admitted to surgical ward with a temperature of 102, pulse 120, and respiration of 30. Patient was apprehensive and excited. Culture of pus from cavity showed many pus cells, many gram negative organisms. Pneumorecus present.

Three sputums were negative for tuberculosis. Blood count taken November 6, 1923, showed R. B. C., 3,620,000; Hgb., 80 per cent; luecocytes, 19,600; neutrophiles, 8; lymphocytes, 9; mononuclears, 6. Patient was operated upon on November 8, 1923, under local anesthesia. Two inches of eighth rib resected in left mid axillary line. Drainage instituted with vacuum method. Urine was amber in color, cloudy, and acid in reaction. Albumin, sugar negative, no casts. Infinite number of leucocytes.

Following operation patient drained very freely, had bad coughing attacks, and occasionally sputum was tinged with blood. November 13, 1923, five days after operation, temperature, pulse, and respiration continued to be elevated. Throat examined by Doctor McIsaac on this date showed a normal larynx and small diseased tonsils.

Three days later patient was feeling somewhat better, but coughing a great deal, his temperature being 101, pulse 110, and respiration 30.

Stitches removed this date, and the 300-c. c. cavity irrigated with Dakins' solution.

On November 17, 1923, a blood count was made as follows: Leucocytes, 8,250, of which 77 were polymorphonuclears, 17 lymphocytes,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

1 basophile, and 5 transitional cells. Urine examination showed nothing pathological.

On November 20, 1923, the patient weighs 101 pounds.

On November 22, 1923, the irrigations with Dakins' solution were discontinued, after which temperature, pulse, and respiration ranged higher.

The patient continued to make daily improvements, with pulse and respiration lower, but temperature ranging from 99 to 102 each day.

On December 10, 1923, the patient was feeling considerably better, although still running a temperature. He is not as short of breath as when he entered hospital. Cavity still draining purulent material and capacity estimated to be about 400 c. c. This is being irrigated with Dakins' solution. Patient thinks he is feeling better since irrigation has been started five days ago.

Discussion of the case.—This patient alone is almost a textbook on lung pathology, symptoms and physical findings. There are signs and symptoms of pneumothorax and cavity, such as hyperresonance to percussion with complete absence of vesicular murmur and voice sounds, and heart displaced somewhat to the right. The extreme toxicity of the patient, with high fever, leucocytosis, headache, and chills, together with dullness over the lower part of left chest and aspiration of 500 c. c. of purulent material, proved the empyema. X-ray pictures show very beautifully the mottled right lung, the cavities on left side with collapsed lungs lightly adherent to the chest wall and some free fluid in left pleural cavity.

Treatment of this patient from the time he entered the hospital until after the rib resection was manifestly surgical. Artificial pneumothorax had been tried by other surgeons prior to his entrance to his hospital and resulted in a pyopneumothorax.

The man's condition was one in which pneumothorax was distinctly contraindicated, as his right lung was very badly diseased with miliary tuberculosis. When the patient entered the hospital, he was a very bad surgical risk, but his extremely toxic state made it imperative that drainage be established, which was done under local anæsthesia, following which he began to improve.

There are five methods of putting diseased lungs at rest: Postural rest; section of the phrenic nerve; introduction of foreign matter to aid compression, such as paraffin; artificial pneumothorax with sterile nitrogen gas; and thoracoplasty.

Now let us go back prior to the injection of the nitrogen and see what the indications and condition were for such a procedure and see if such indications and conditions were present.

Whether a patient should be treated by artificial pneumothorax or not depends very much upon what treatments he would receive if artificial pneumothorax were not administered. So much can be

Digitized by Google Original from UNIVERSITY OF MICHIGAN

accomplished in these days by faithfully applying such measures as open air, rest, exercise, food, psychotherapy, hydrotherapy, heliotherapy, and by relieving distressing symptoms and looking carefully after the patient's comfort, that there remains only a small number of patients unsuccessfully treated. In this connection we must remember, however, that there is no specific remedy for the disease, and that results are achieved only by employing enough helpful measures to raise the patient's fighting strength to the desired level. Pneumothorax is not a cure for tuberculosis but offers aid under certain conditions which may otherwise be attended by failure. If the diagnosis is made sufficiently early and other approved methods of treatment are intelligently applied, pneumothorax will rarely be found necessary.

Some would recommend pneumothorax in all cases of tuberculosis, even those of the early clinical types, but he who takes this attitude wholly misunderstands tuberculosis, totally underrates the efficacy of present methods, and greatly magnifies the importance of, and minimizes the danger of, artificial pneumothorax. If pulmonary compression were a "cure" for tuberculosis, then such a course would be logical. But it is not; it is only a makeshift.

There is one type of case which is particularly adapted to treatment by artificial pneumothorax and that is the unilateral, acute, advancing ulcerative tuberculosis which fails to yield to ordinary measures.

Artificial pneumothorax has recently been recommended in the treatment of hemorrhage, particularly in the recurrent attacks of bleeding, where a few mouthfuls are expectorated day after day. Those cases which result from an open vessel of any size as a rule prove fatal before pneumothorax could be performed. Other types of plumonary hemorrhage nearly always stop of their own accord if the patient is given but half a chance. If he is treated by rest and sedatives, particularly when necessary, in order to check coughing, nature will nearly always take care of the lesion herself, in spite of what is being done for the patient.

If, however, a given patient can not avail himself of the advantage of a change of climate, the treatment of collapse of the lung by nitrogen injection or by one of the other methods of extra pleural thoracoplasty may be tried.

To Friedrich of Marburg is due the credit of originating the thoracoplastic operations of to-day. He found that after a rib resection for osteomyelitis of the ribs, complicating pulmonary tuberculosis, the lung, pleura, and soft tissues collapsed and contracted and the patient was greatly improved. He then began to study and select his cases, and resected portions of all the ribs in different stages, under local anaesthesia, so that following the last operation the entire

Digitized by Google Original from UNIVERSITY OF MICHIGAN

side of the chest collapsed. This operation he called pleuropneumolysis.

Indications for thoracoplasty are: a mainly unilateral process with a bad outlook for cure by ordinary means; chronic fibrous phthisis with thick pleural deposits and a rigid chest wall, offers the most frequent indication. Contraindications are that the opposite lung must contain no large cavities or evidently active areas, although the better lung need not be perfect.

Hemorrhages, large amounts of sputum and fever do not contraindicate the operation but rather strengthen the indications. Thoracoplasty, since it collapses the chest for good and all, should never be done before pneumothorax has been tried and has failed or proved inefficient.

Thoracoplasty in two or more stages can be risked even in a very sick patient, such as this patient was. His system was absorbing the toxic material in his chest at such a rate that he would have undoubtedly died in a very short time had not the first stage of a graded thoracoplasty with drainage been done.

While it is not intended to discuss here the relative value of graded thoracoplasty over any other procedure, it is merely brought forward because it is believed that it was this procedure that bridged the patient over a very evident death.

Since his rib resection the patient has been a medical case, and if it is possible for us to establish enough drainage so that his fever will subside, or if we could improve the miliary condition of his right lung, we might be able to perform another thoracoplastic operation. Our chances of being able to improve the miliary condition of his right lung by any line of medical treatment we know of are so few that the final outlook is grave.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

NOTES AND COMMENTS

A CORRECTION

In the editorial section of the BULLETIN for May, 1923, appeared an article entitled "A chronicle of tuberculosis," which was based on the Schorstein memorial lecture on "A retrospect of 40 years in the history of tuberculosis," delivered by Dr. Percy Kidd at the London Hospital Medical College. Unfortunately in the preparation of this paper the writer gave no credit to the work of American investigators of tuberculosis. As we are reminded in a letter to the Surgeon General from Dr. Mazyck P. Ravenel, of the University of Missouri, in his lecture "Doctor Kidd quoted from Bulloch, who showed plainly that three Americans had pointed out differences between human and bovine bacilli before Koch's paper in 1901, and among these he mentioned especially Theobald Smith, whose first paper was published in 1896, and who made a further contribution on the subject in 1898."

To quote from Doctor Ravenel's letter: "The editorial would lead one to suppose that two years passed without any challenge of Koch's conclusions. The facts are that a paper was read at the congress in the section on pathology and bacteriology, and an address was given at a general meeting the next day, both by myself, in which Koch's conclusions were controverted. Both of these can be found in the proceedings of the congress and one in the London Lancet, August 10, 17, and 24, 1901. This was followed by a more complete paper, giving absolute proof of the position then taken, read before the Philadelphia Pathological Society, May, 1902, also by myself.

"It is true," Doctor Ravenue continues, "that the editorial is so worded as to leave one under the impression that the whole controversy turns on the question of whether milk or human sputum is the chief source of tuberculosis, which is not the question at all. This is proven by the statement made in the editorial, which is correct, that Koch considered infection by the bovine germ as so improbable that it was not necessary to take precautions against it. The question was the possibility and danger of human infection by the bovine germ and not the relative importance of them. At the present time the danger is universally admitted, and the only discussion is on the relative proportion of cases due to one or the other."

Referring to the two following sentences which are based on Doctor Kidd's lecture, "Two years later von Behring challenged

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Koch's conclusions and asserted that milk is the main source of tuberculosis. This controversy has raged even up to the present time, but it seems now to be generally agreed that Koch was correct," Doctor Revenel directs the attention of the writer of the editorial article to the work of Doctors Park and Krumweide (Journal of Medical Research, vols. 23, 25, 27) and to "the work of the English Royal Commission, which alone would prove the incorrectness of some of the statements quoted from Doctor Kidd."

Doctor Revenel's challenge to this article is prompted by his desire that medical history be correctly recorded, and his criticism of this article is gratefully acknowledged by the editor of the BULLETIN, who prepared the paper in question.

THE VALUE AND LIMITATIONS OF THE RÖNTGEN RAY IN THE DIAGNOSIS OF PULMONARY AFFECTIONS

Dr. W. L. Rathbun, in his discussion of the diagnosis of early pulmonary tuberculosis, which appears elsewhere in this issue of the BULLETIN, emphasizes the importance of the X ray as a factor in the diagnosis of this disease, but unfortunately the scope of his paper precluded extended consideration of the subject. It is the general belief among those specializing in tuberculosis that the Röntgenogram is indispensable in the diagnosis of tuberculosis of the lungs. However, this method of examination occupies a special field in diagnosis, and its value depends entirely upon the experience of those who interpret the plates. A number of pulmonary conditions whose existence is not easily determined by physical examination are revealed by the X ray to one skilled in the interpretation of the picture and the complexity of the subject may be readily seen by a perusal of the following article on "The value and limitations of the Röntgen ray in the diagnosis of pulmonary affections," by Dr. Barnett P. Stivelman, of the Montefiore Home Country Sanitarium at Bedford Hills, N. Y., which appeared in the Medical Journal and Record of January 6, 1924.

"It is perhaps fair to state at the outset that there can be no doubt that the intrinsic value of the Röntgen ray far surpasses that of any other laboratory examination; that because it brings the human lungs within the range of that special sense upon which we place greatest dependence, it is a method of inestimable value, and that in many cases it is the only method which holds forth any hope of reaching a correct diagnosis. However, in the study of pulmonary conditions it has suffered and may continue to suffer in reputation because, on the one hand, many who are unfamiliar with the type of evidence furnished by this method have expected too much of it, and on the other hand, many specializing in its use have exaggerated

Digitized by Google Original from UNIVERSITY OF MICHIGAN

its importance and have made claims which are unwarranted by the results obtained. Moreover, because of the supposed infallibility of this method, it seems that the burden of diagnosis of pulmonary disease has in some medical circles actually been transferred from the shoulders of the clinician to those of the Röntgenologist and the X ray has been used virtually to the exclusion of the older methods of examination.

" It is, therefore, perhaps not untimely to examine into the value and limitations of the Röntgen ray in the diagnosis of some pulmonary affections, and though I may only scratch the surface of this most important subject, I shall endeavor to point out some of the difficulties in the interpretation of chest Röntgenograms.

" It is now universally accepted that because of their anatomical and physiological relation to the lungs, the tracheobronchial glands and the cluster of glands in the hilum region are the first to be involved when large numbers of tubercle bacilli, regardless of the portal of entry, reach the pulmonary tissues. These glands, reacting to the noxious invader, undergo inflammatory, and later permanent, structural changes which increase their size and make them less permeable to the Röntgen ray, with the result that they cast a larger and denser shadow on the Röntgenogram than the normal glands. Clinicians will agree that no known diagnostic method will so surely demonstrate the existence of diseased glands as the X ray.

"On the other hand, these glands are frequently the despair of the Röntgenologist because tuberculosis is not the only etiological factor in the causation of this glandular enlargement. The hilum glands increase in size and density in bronchitis and bronchiectasis, and often attain even a larger dimension during and after the exanthemata and more especially measles, whooping cough, and diphtheria. Moreover, such glandular enlargement appears early in the course of pulmonary abscess and persists long after most nonspecific pneumonic lung processes. The Röntgen appearance of these glands does not point to any etiological relationship, and it is extremely hazardous to make, as is often done, a diagnosis of tuberculous tracheobronchial adenopathy from the X-ray plate alone. Many children are often deprived of an education, separated from their parents, and often banished to distant health resorts on the strength of the Röntgen ray appearance of the hilum region. The X ray in such instances is of quantitative rather than qualitative value, and it is the clinical history and the discovery of associated conditions that will solve the problem, and not the Röntgenogram. A history pointing to tuberculous toxemia in association with large tracheobronchical glands would suggest that the patient is in need of treatment. On the other hand, when no such clinical symptoms are complained of, no diagnosis of active disease is justifiable even in the presence

Digitized by Google Original from UNIVERSITY OF MICHIGAN

of such glandular enlargement, and the patient should be left severely alone. It is pertinent to add that the denser the shadow cast by these glands on the Röntgenogram the less the clinical value of their discovery, because such shadows show that scarring, fibrosis, and calcification have taken place in these glands, which under the circumstances can be placed in the category of harmless historical landmarks.

"PERIBRONCHIAL INFILTRATION

"It requires no expert in physical diagnosis to discover an advanced tuberculous parenchymatous lung lesion, nor a Röntgenological wizard to find a similar condition on carefully taken Röntgenograms, but peribronchial tuberculous lesions usually defy detection on physical exploration of the chest. The Röntgen ray alone will disclose the peribronchial thickening, and sometimes the beaded pussywillow appearance along the ramification of the bronchial tree. On the other hand, similar shadows are cast by conditions other than tuberculous peribronchial infiltration. Chronic bronchitis associated with emphysema and asthma, and bronchiectasis, anthracosis and silicosis are often accompanied by such X-ray finding and there are rare cases of lymphangitis malignancy, the Röntgen ray plates of which are indistinguishable from tuberculous peribronchial infiltration. Here, as in the first instance, it is the clinical history of the case, the finding of associated conditions, the history of exposure to the dusty trades, and not the X ray, which will clinch the final diagnosis. A diagnosis of active peribronchial tuberculosis should not be made unless there is clinical evidence of tuberculous toxemia, such as elevation of temperature, acceleration of pulse, loss of weight and strength, cough and other findings, in addition to the Röntgen ray findings.

"Many patients are sent to sanatoria and hospitals for the tuberculous because of the accidental discovery of peribronchial thickening which frequently denotes nothing abnormal or may be due to conditions which require different modes of treatment entirely.

"EARLY TUBERCULOSIS

"The Röntgen ray is the most reliable method whereby the true extent of any advanced tuberculous lung lesion can be accurately determined. In this respect it surpasses by far the findings of the keenest clinician. It is different in the case of early tuberculosis. Here the clinical history and physical findings at times point to the existence of a small lesion at either apex when the Röntgenogram is frankly negative. It appears, therefore, that in a given case a negative Röntgenogram does not necessarily exclude the presence of

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pulmonary tuberculosis. The physical findings and particularly the history of tuberculous toxemia, etc., should be relied upon in arriving at a positive diagnosis regardless of the negative X-ray findings. On the other hand, when the history and physical findings are frankly negative and the X ray shows small discrete tubercles or evidence of slight fibrosis at one or both apices, no alarm need be caused at their discovery because the very presence of these discrete and old lesions indicate that the organism has effectively conquered the invading tubercle bacilli and these shadows represent, as has been aptly stated, 'the monuments commemorating the battle won by the fighting forces of the host.'

"TUBERCULOUS AND NONTUBERCULOUS PULMONARY CAVITATION

"Almost pathognomonic of pulmonary tuberculosis is the Röntgen ray finding of an area of rarefaction or cavitation anywhere but particularly in the upper lung fields, especially if this area is surrounded by an appreciable wall and is situated in the midst of shadows signifying parenchymatous infiltration. It is almost pathetic to watch the keenest clinician miss fairly extensive cavitations which speak for themselves on the Röntgenogram. The failure to elicit these on physical examination is due either to the fact that the communication between the cavity and its drainage bronchus is temporarily blocked by a plug of mucus or sputum, or the cavity may be entirely filled with fluid, conditions which preclude the generation of those physical signs by which cavities are recognized. Basal cavities and cavitation in the hilum region and more especially pleural annular shadows, which are in reality a form of interlobar pneumothoraces, are more often missed than elicited on physical exploration of the chest, but almost invariably found on the Röntgenogram.

"However, a diagnostic pitfall can be avoided when it is remembered that not all areas of rarefaction or cavitation are of tuberculous origin. Such areas of rarefaction near the hilum region or basal fields may be due to extensive bronchiectasis resulting from chronic bronchitis, interstitial pneumonia, and changes secondary to pleural disease. These dilated bronchi are engendered by increase in intrapulmonary tension incident to long continued and distressing cough on the one hand, and traction on the outer wall of the bronchi by the contraction of the fibrous tissue when pulmonary sclerosis is present on the other. Indeed, it has long been known that not all areas of rarefaction are due to ulceration of the pulmonary parenchyma. Areas of rarefaction in the lung tissue may be due to abscess formation, and when accompanied by collateral inflammation they are in their early stages indistinguishable from tuberculous cavitation on Röntgen ray examination alone. Malignant metastatic nodules, when their circulation is shut off, may ulcerate and discharge

Digitized by Google Original from UNIVERSITY OF MICHIGAN

their contents into the nearest bronchi and thus exquisitely simulate tuberculous cavitation, while streptothricosis and spirochetal pulmonary gangrene may be accompanied by extensive cavitation, which on Röntgen-ray examination alone are indistinguishable from tuberculous cavitation. In all such instances a painstaking study of the clinical history, symptomatology, reinforced by repeated physical exploration of the chest and particularly careful examination of the sputum, will lead to a correct diagnosis while reliance on the Röntgen ray alone may leave cause for regret.

"MILIARY TUBERCULOSIS

"The characteristic widely disseminated snowstorm appearance of Röntgen-ray shadows in acute military tuberculosis of the lungs may be simulated to a marked degree by certain forms of silicosis and anthracosis and particularly by miliary pulmonary malignancy and bronchiolitis. The Röntgen ray in such cases can not be relied upon for an accurate differential diagnosis. It is the clinical history pointing to the primary malignant focus or the occupational hazards the patient may have been exposed to that will clinch the diagnosis. A fatal prognosis has not infrequently been given on X-ray findings of miliary pulmonary tuberculosis when in reality there existed a temporary bronchiolitis or a more or less innocuous anthracosis.

"ACTIVE AND QUIESCENT PULMONARY TUBERCULOSIS

"The discovery of a tuberculous lung lesion is of no greater significance than the determination as to whether or not this lesion is quiescent, or in a state of clinical activity. In the first instance, that is when the lesion is inactive, no treatment whatever may be necessary and the patient, under competent supervision, may be allowed to go about his business as usual. On the other hand, when clinical activity is diagnosticated, judicious treatment is to be instituted at once if recovery or an arrestment of the disease is to be attained. This is perhaps the most important problem in phthisiology. The question now arises, What assistance does the Röntgen ray offer in the determination of the clinical activity of any given lesion?

"Those who are forever on the lookout for a short cut in the practice of medicine and particularly those who enjoy a limited clinical experience claim to have little difficulty in finding evidence of clinical activity on the Röntgenograms, and some go so far as to assure us that they are able to foretell certain pulmonary catastrophes as well as evaluate the degree of tuberculous toxemia from the appearance of the X-ray plate. On the other hand, clinicians of widest experience do not feel quite so certain that such information can be

Digitized by Google Original from UNIVERSITY OF MICHIGAN

gleaned from the Röntgenograms, because the reparative and destructive forces which may be and frequently are simultaneously at work in any portion of the lung do not easily lend themselves to differentiation even on the autopsy table and areas of fresh tuberculization may be so situated as to be completely obscured by an old thickened pleura and thus elude the Röntgen ray. Moreover, the newest and frequently the most active tuberculous foci are most easily penetrated by the X-ray and cast but a faint and insignificant shadow on the plate. The collateral inflammation around the tubercles, which to some is the criterion of activity, is present in many nonspecific intercurrent infections which do not influence the tuberculous process adversely and is often absent in the most typical cases undergoing an exacerbation of tuberculous activity. Inquiry into the patient's complaints especially into symptoms signifying tuberculous toxemia, is the only means of determining the activity of any tuberculous process regardless of the X-ray findings.

"PULMONARY MALIGNANCY

"The diagnosis of pulmonary malignancy has been much simplified as a result of the many recent reported studies. Indeed, the relative increase in the incidence of pulmonary neoplasm is in no small measure due to the fact that we are now on the lookout for, and better able to discover, these conditions antemortem. The Röntgen ray is at times of inestimable value in the detection of some of these neoplasms, but it often fails us in the most complicated cases. It is a matter of common knowledge that early metastasis in the lung tissue can not in the majority of instances be discovered without the aid of the Röntgen ray, and not infrequently metastatic nodules of much larger size escape detection on most careful physical explorations of the chest only to be easily elicited Röntgenologically. It is different in the case of primary pulmonary malignancy. Here the X-ray shadow which is usually dense and homogeneous, especially when situated in the upper lung field, may exquisitely simulate an old fibroid tuberculous process with pleural thickening, pulmonary abscess, and localized or interlobar effusion.

"Matters are further complicated when there is a pleural exudate secondary to the lung tumor. The Röntgen shadow in this case is indistinguishable from an ordinary effusion or extensive pleural thickening. The age of the patient may not help in the diagnosis, because both fibroid phthisis and pulmonary malignancy are found in patients of the same age group. The differential diagnosis will then rest on the clinical history and not the X ray. A history of pulmonary complaint of long standing, especially cough, hemopytsis, frequent colds with elevation of temperature, when associated with

Digitized by Google Original from UNIVERSITY OF MICHIGAN

bilateral disease and evidence of bronchitis and emphysema will speak in favor of pulmonary tuberculosis, even though the sputum may give negative findings. A history of a recent pneumonic process or surgical intervention in the upper respiratory tract followed by profuse and foul expectoration, clubbed fingers and evidence of toxemia, will speak in favor of pulmonary abscess. Thoracentesis will help in the determination of the presence of a localized or interlobar effusion. On the other hand, a history of cough or more recent onset, in a patient past middle age, loss of weight, troublesome and persistent pain on the involved side of the chest, and particularly early dyspnea in the absence of cardiorenal disease, is suggestive and requires further investigation. If in addition to such a history, physical exploration of the chest discloses an absolute unilateral lesion with a flat note on percussion, feeble breath sounds or cornage and some evidence of glandular enlargement, especially when tubercle bacilli can not be found in the sputum, a diagnosis of pulmonary malignancy may safely be made. When there is a a coexisting effusion, a diagnosis can not be arrived at Röntgenologically unless some of the exudate is removed and replaced by air in accordance with the method recently described.

"ACUTE AND CHRONIC PNEUMONIC PROCESSES

"Acute pneumonic processes are easily identified Röntgenologically, but it is well to bear in mind that even in such instances the evidence is quantitative and not qualitative because the X-ray shadow does not point to the etiological nature of the pathological process. Atypical lobar pneumonias are frequently confounded with pneumonic phthisis and, unless the clinical course of the disease is carefully studied and other laboratory findings consulted a differential diagnosis may be impossible. The same condition obtains in chronic interstitial pneumonia. Here the Röntgen evidence is in itself rarely sufficient to point to a definite diagnosis. Unilateral chronic pleuropulmonary tuberculosis, especially the types which follow pleural effusions and the suspension of pneumothorax treatment, is indistinguishable Röntgenologically from interstitial pneumonia of nonspecific origin. In such cases we must resort to the clinical history, and especially, careful sputum studies, for a differential diagnosis. A history of cough, expectoration, and recurrent attacks of fever, night sweats, and other evidence of toxemia will point to pleuropulmonary tuberculosis, whereas a history of lobar or repeated bronchopneumonia or empyema treated by aspiration or thoracotomy together with signs and symptoms of bronchiectasis will speak in favor of chronic interstitial or fibroid pneumonia.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"PULMONARY SYPHILIS

"In recent years the subject of pulmonary syphilis has been widely discussed. The time has not yet arrived when the frequency of its occurrence can be correctly estimated. Suffice it to say that it is seen less often than some Röntgenological reports would indicate. Whether it is encountered in the form of diffuse fibrosis or gumma of the lungs a definite diagnosis can not be reached on the basis of a Röntgenologic examination alone. In the first instance the plate can not be distinguished from pulmonary sclerosis of nonspecific origin and in the latter case it may exquisitely simulate malignant metastasis, localized pleural effusions, pulmonary abscess, and at times patches of frank pulmonary tuberculosis. Here again it is the clinical course of the disease, the results of the physical, sputum, and blood examinations, that must determine the true nature of the affection.

"I have attempted to delineate the value and limitations of the Röntgen ray in the diagnosis of the more prevalent pulmonary conditions and hope that I succeeded in pointing out the pitfalls in the interpretation of some Röntgenograms. I have omitted the discussion of the various types of pneumothorax, pleural effusions, and bronchial affections for obvious reasons. The question as to which method of examination, physical or Röntgenological, is supreme is beside the mark. Both methods are adjuncts of the greatest value to the history, particularly if we are informed of their limitations. To depend upon one method to the exclusion of the other is to invite diagnostic disaster. It is no less the duty of the physician to collect, coordinate, and weigh carefully the evidence discernible by all methods before arriving at a final diagnosis as it is the legal obligation of the judge to examine all witnesses before pronouncing a verdict."

SULPHARSPHENAMINE ON BOARD SHIP

In Doctor Hayden's report on the use of sulpharsphenamine at the Mayo Clinic, which appears elsewhere in this number of the BULLETIN, he refers to the fact that the use of this drug has been favorably reported by medical officers of the British Navy. In this connection it is interesting to review a paper on "The treatment of syphilis afloat," by Surg. Commander J. H. Fergusson, Royal Navy, which appeared in the Journal of the Royal Naval Medical Service for July, 1923. Under the name of sulfarsenol, sulpharsphenamine has been used in the British Mediterranean Fleet for three years. According to Surg. Commander Fergusson the drug fulfills all the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

requirements of the efficient treatment of syphilis at sea and he recommends its issue to all ships for the following reasons:

1. When given intramuscularly the results obtained are at least as good as any other drug that has hitherto been used.

2. The ease and safety of its administration on board ship; it requires no nicety of technique, nor special apparatus.

3. It provides a ready method of treating the infection at the very commencement, and before it has become generalized.

4. It provides for the continuity of treatment which is so essential and which is so often interrupted by the absence of facilities for administering arsphenamine and frequent transfers of men.

No special preparation of the patient prior to the administration of the drug has been found necessary in the British Navy, except a purge the night before treatment and an observation of the urine; only as a precaution are patients kept in the sick bay on the day of injection, when, if there is no rise of temperature, the patients return to duty in the evening.

With regard to the preparation of the compound for injection all that is required is a syringe with a platinum needle and some sterile distilled water. The drug is supplied to the British Navy in ampoules of 0.48 and 0.6 gram; after sterilization the neck of the ampoule is broken off and 1 c. c. of distilled water is added to the ampoule, the drug is readily soluble and the solution is ready for injection.

The speed and ease with which a number of cases can be dealt are points in favor of this drug. Fergusson reports no complications following hundreds of injections, beyond an occasional evening rise of temperature, a solitary case of jaundice, and possibly a case of dermatitis; 90 per cent of the cases returned to duty on the evening of the day of administration.

The fact of having a drug on board ship for the immediate treatment of all venereal sores is of great importance, and if administered at once cases need never proceed to the stage of a positive Wassermann. It is the consensus of opinion that a venereal sore with even the slightest chance of its being due to syphilis should be treated at once as potential syphilis and receive a course of sulpharsphenamine.

A NOTE ON INTERPRETATION OF DENTAL RADIOGRAPHS

A word of caution is necessary to the individual who holds a dental radiograph to the light and seeing no marked area of radiolucency gives a professional opinion that a tooth is not the seat of an infection in the jaw. Dr. John Oppie McCall in a paper on "Oral diagnosis," published in the December Journal of Dental Research, very

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pertinently calls attention to the interpretation of radiographs in connection with the consideration of periapical lesions, other than the classical circumscribed radiolucent areas. First are mentioned the two types commonly recognized as the circumscribed and diffuse regions or areas; the third type is that which exhibits neither radiolucency or radiopacity immediately at the apex, but which does show a definite alteration in the cancellation of the bone adjacent to the apex. Such regions may show a lessened density but frequently are only to be detected by the tendency of the cancellous spaces bounding them to assume a somewhat chainlike continuity. The fourth type, the periapical opaque region, when of a diffuse character, is also to be considered in most cases indicative of an established infection when occurring around a pulpless tooth, and even when occurring around a vital tooth under certain circumstances. McCall disagrees with Hartzell and Pollia in their belief that suppurative pockets in cases of periodontoclasia are of relatively less metastatic importance than periapical lesions, notwithstanding the larger area of tissue involved. His belief is based on the assumption that the only drainage afforded the periapical regions is the blood stream through the lymphatics, whereas the parietal pockets drain largely into the mouth. If, however, the pocket extends to the apical third, prognosis should be adjudged with the greatest care, as such lesions are apt to involve pulp circulation. Diagnosis of this latter condition is confirmed if the pericementum at the apex is perceptibly thickened, or if the periapical bone exhibits a diffuse radiopacity. Marked radioactivity of the cancellous bone just beyond the peridental lamella is usually indicative of a deep-seated infection.

Doctor McCall points out that streptococcal infection is insidious and, in contradistinction to infection with the staphylococcus, does not cause a violent defensive reaction; indeed with a pure streptococcal infection the patient is usually unaware that an infection is taking place. This explains why infections about the roots of teeth usually present no subjective symptoms to the patient, and it is only after an actual injury to a secondary tissue has resulted that subjective or objective symptoms make their appearance. The streptococcus seems capable of producing one type of disease in one subject and another in another. This fact with the relative severity of the secondary disease as compared with the mild character frequently exhibited by the primary disorder as well as the length of time which frequently elapses between the incidence of the primary disorder and the onset of its secondary sequelae lends readily to skepticism. In addition many cases are observed in which secondary disease has not as yet made its appearance. In this connection it must be remembered that infection by the streptococcus is subject

Digitized by Google Original from UNIVERSITY OF MICHIGAN

to the laws which govern all infections. No organism can produce disease, except when resistance is lowered. Organisms may live and maintain themselves in the tissues for varying lengths of time without producing disease. It is this factor of resistance which explains the presence of many regions of alveolar infection in individuals who maintain a state of health for long periods of time. It is also the factor of resistance which furnishes an explanation for the apparently paradoxical and gross secondary effects of minute regions of infection at the end of the tooth roots.

For the patient who is ill and has been certified by his physician as suffering from a disease caused wholly or in part by focal infection, we should see that recommendations are made which will without question, free the mouth from foci of infection. In diagnosis we must be suspicious of every possible focus of infection as long as a patient's health gives evidence of injury from that source.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NAVY NURSE CORPS

MY FIRST DUTY ABOARD SHIP, THE U. S. S. "RELIEF"

By Miss THOMASINA LIBBY, Nurse, United States Navy

The *Relief* has been called a fair-weather ship, so I can tell you nothing of storms and shipwreck, but much of warm weather and sunshine. One day in September, 1922, while on night duty at Chelsea, Mass., I was awakened by one of the nurses, who said, "Wake up; your orders for the *Relief* are here, and I couldn't let you sleep another minute." Rubbing sleepy eyes, I said "No?" for at the time when transfers were expected at a station, many jokes were played and false alarms given. However this report was soon confirmed and then came the usual scramble to pack and get away. I took the Fall River boat; it was a wonderful moonlight night, which I had to enjoy alone. Arriving in New York, I was told the *Relief* was anchored off Ninety-sixth Street, and making good time, I arrived very promptly, only to be told that the *Relief* boats did not come in there but down at Eighty-sixth Street. To Eighty-sixth Street was not far, so to Eighty-sixth Street I went and was told the *Relief* boats came in at Eighty-second Street. At Eighty-second Street, was told to go to Seventy-ninth and from there to Seventy-second. At Seventy-second, to my surprise was told that a boat was due very soon.

As a motor sailor from the *Relief* came alongside the dock and the patrol officer called out "Relief! Relief!" I began to feel the thrill of belonging—"That's my boat, that means me!" As we approached the ship, I saw white things waving in the air, and in great surprise, I said to myself, "Now is not that lovely of the nurses on board to so cordially bid me welcome." As I came nearer I could hear the band playing, and the many white things waving a cordial welcome to me turned into white trouserlegs rising and falling to music in the setting-up exercises of quarters, and as I came timidly up the gangway, off they ran as fast as they could go in "double time." 'Twas a thrilling introduction to the ship and I was taken immediately to the nurses' ward room where I at once fell into the chimes; this called forth one of the nurses who extended the right hand of fellowship, and I was there, on board the *Relief*, water and ships on all sides of me, a member of Uncle Sam's Navy afloat.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

I must tell you some of the things I had to get used to. I must never say "upstairs" or "downstairs," but "topside" and "down below," and "up the ladder" and "down the ladder." I must remember always to step up, that I forgot many times; my poor shins still bear witness, for at every doorway and at the top of every ladder is a portion of the bulkhead over which one must step or bear the consequences. We must get used to bells telling the time every half hour, whistles blowing, guns booming at unexpected moments, winches screeching in the wee small hours of the morning, water swishing on the decks, and all sorts of thumping and banging over head, and blowers and electric fans whirring at all times. Does that sound as if one could never sleep? Will you believe me when I say that sometimes I will hear scarcely a bell all day, that I can sleep through the preparations for getting under way, and that even a gun booming will scarcely awaken me?

It was on Thursday I came aboard and on the following Monday we weighed anchor and set sail for Yorktown, Va. My qualms of seasickness were not many or serious and at Lynnhaven Roads, where we stood by while the battleships did their maneuvers and gunnery practice farther out, I became fairly well accustomed to the constant motion. At Yorktown, where we spent our week ends, the water was perfectly smooth, and if we could not have seen it we would never have known we were on the sea. For one month here I was on the ship, leaving it only once, when in "Abandon ship drill" we took to the boats. That was another thing to which we had to become accustomed; on certain days the siren would suddenly shriek, and the word "Fire drill" be passed. Some corpsmen would quickly close doors and ports, others get blankets and other designated articles, some stand by to carry out patients, doctors muster their boats' crews and attend to preparations for removal of patients, each having his special part to do in the preparations for leaving the ship. The different shrieks of the siren meant, first, fire or collision, then at last abondon ship. To me, no matter what happened, it was always a part of the drill, so one day when two sailors capsized a boat, the "Man overboard" rang out and shortly after, the sailors came dripping up the gangway. I thought it was all a part of the game and very well done, and was much surprised when told later that a line had broken, throwing the sailors into the water; as they could swim very little, they were really frightened and glad enough to be rescued.

After the month's stay at Lynnhaven Roads and Yorktown, we returned to New York, and did not New York look good to us! We could hardly wait to get the first possible boat ashore; and walk. I walked between 8 and 10 miles that first afternoon by actual count. Neither trolleys, busses, taxis, subways, or elevated trains held any charms for me while I could tramp, tramp, tramp on terra firma.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Next in our rounds of pleasures ashore were the pleasant visits at the quarters in Brooklyn. Most of us had old shipmates there, but if not, we were made just as welcome and as much a part of the family. The shops and theaters took their toll of our time and money, and after a week or 10 days of the city's gaieties we were happy to weigh anchor and set sail again to Lynnhaven and Yorktown for the regular program.

This time, to my great pleasure, I found I had a friend living a few miles out from Gloucester Point, and spent a wonderful week end with her. Among other interesting things, I was told that the soil in that section of Virginia was all alluvial soil, and bones and shells I saw that had been buried beneath several layers of soil for hundreds of years.

Our return port after this trip was Philadelphia, and how well I remember that morning coming up the Delaware, the deserted shipyards, the discarded ships, the giant floating crane, the largest in the world, and in the distance watching closely over all, the benign statue of William Penn. At League Island, as at Brooklyn, we were made welcome to the quarters, their bed, board, and baths, and we as happily entertained on board ship the nurses from there.

An orgy of shopping always follows one of these trips, and as it was leave time for the Christmas holidays, we shopped continuously as long as the money lasted, saving only enough for the home trip and return. Then came Christmas "at home," and it being my first real going-to-sea experience, the home folks were regaled at all times with tales of what happened here and there, how much I was laughed at for not knowing starboard from port, fore from aft, abeam from abaft, a boat from a ship, a chief with gold chevrons from a captain with gold stripes, and softly, let us say, the times I looked a little pale, was a little seasick. After the holidays we came straggling back in twos and threes; the morning I came back the fog was so thick that the cars scarcely moved, and after arriving at the navy yard I nearly lost myself and was almost overleave.

When we weighed anchor on January 3, it was for sunny Cuba we set sail. As I have not yet told you how wonderful I thought my stateroom, en route to Cuba, I will do so. Of course, at first it looked small for two people, but at the same time it was a marvel to me the number of things we could each store away in the space provided. On the wall is a book shelf containing two deep shelves about 3 feet long; next to that an electric fan which always runs at night, and often during the day, as we never suffer from the cold, but sometimes feel the heat. Then comes a double-wall cabinet with a mirror in each door; shelves beneath and inside give ample room for all our reserve supply of toilet articles. What those apparently

Digitized by Google Original from UNIVERSITY OF MICHIGAN

small cupboards will hold is always surprising. At each side of this cabinet is a good-sized port, or windows, perhaps, as they are square, not round. Our washstand, with its duplicate of everything, is all one can desire for its purpose, and our combination desk and chiffonier and a real safe with a combination is just the climax, which one must see to appreciate.

Then last, but not least, come our bunks, one over the other, with drawers for shoes underneath. Being the last comer, the upper is mine; as no ladder is provided, one must do the next best thing and stand on a chair or the lower bunk and climb or spring, being careful not to spring too high and bump your head, and not to fall short of your mark, lest you lose your balance and tumble backward. At first, all this seemed rather difficult, but now rather fun, and once there you do not have to answer the telephone, start the fan, or put out the lights. The one thing I have not accomplished yet is always to remember "low bridge" when sitting up suddenly in that top bunk.

The most wonderful thing on our trip to Cuba was the blue, blue water. Think of the very bluest thing you know, and it is bluer than that—a deep, live blue. The journey was a smooth one, every one feeling fine. Scarcely a ship was seen on the way, and the first land I remember was, or would have been by day, San Salvador. All we saw was the light, but the next morning we saw an outlying group of the Bahamas; then on January 8, toward evening, the mountains of Cuba rose through the haze, and many glistening, flying fish, almost like humming birds or skipping stones, delighted us.

During the night we came in around Cape Maysi and between 8 and 9 a. m. our ship swung about to enter Guantanamo Bay. Cuba looked like a procession of mountains and hills, beautiful in the distance with their outlines softened by the haze. On nearer approach, they looked very bare, with here and there a few scattered palm trees, many places entirely without vegetation, in others, low lying shrubs and many cacti. As we rounded Guantanamo Light we were in a horseshoe-shaped cove with Cuba on three sides of us, the water became a beautiful clear green instead of the dark blue of the deep sea. The *Prometheus*, the *Proteus* and the poor old *Iowa* were the only ships in before us. On the port side as we entered were the marine quarters, the men on the hill, and below on Fisherman's Point, the bungalows of the officers. I was fortunate in being detailed on ward A in contagion, which is aft and above decks, so could look after my patients and yet see all that was going on. We could not really settle down to business until we were safely in and securely tied up to the buoy. 'Twas a wonderful day and soon turned out to be a work day, as patients began coming in. Pneumonias were my

Digitized by Google Original from UNIVERSITY OF MICHIGAN

specialty at that time and you know they keep one busy, so, if up to this time I have given you the impression that there was no work for us on the ship, you must change it at once, for we have always been fairly busy, and in Cuba very, very busy.

On January 11, the ships began to come in—the *Wyoming*, the *North Dakota* and the *Utah* coming first, and oh, how grand they looked to me, steaming in with everyone at attention and guns saluting. Several destroyers and submarines followed and again I felt that wonderful thrill at being a real sea-going member of the United States Navy. Inspection comes on board ship as elsewhere and the same scrubbing and shining goes on in preparation, and the same dignified and impressive procession takes place and the same sigh of relief follows.

Our main recreation in Cuba was hiking and swimming, with a trip or two to Caimanera and Guantanamo City. One picnic we had out beyond the lighthouse at Cable Beach. There I saw my first Portuguese man-of-war, rather limp and sodden, high and dry on the beach, but still brightly colored and able to float when thrown back into the water. A few tiny shells and fairly pretty bits of white coral we collected as souvenirs, had a delicious supper, sang songs after the usual fashion of picnics, and came home by the light of the moon.

The swimming was my greatest delight and I never did get enough of it. I had just learned to dive before I came to the *Relief*, so felt quite proud of myself; but my pride was of short duration, for following my usual procedure, I walked to the end of the springboard, slowly and carefully bent double, that is, tipped over as far as possible, and dropped; I held stiff, so did not flop, and the dive was, though slow and lifeless, clean cut enough, but I almost went nearly to the bottom and thought I never would come up again; rose puffing and blowing and more or less "pop-eyed." Once or twice I was allowed to do this with proud satisfaction, then Captain ——— thought that he had had patience long enough and said, "What's the idea of posing so long? Let her go!" and in I went at once, no more waiting after that. Miss ——— could dive easily and gracefully and, apparently without fear, while I had to make myself go, happy though I was after I had done it. One day she said "Let us dive off the piles." "Have you done it?" said I; "Yes," said she; "All right," said I, though the piles looked to me as tall as the masts. Up went Miss H——— and down like a mermaid and up went I, but, oh, the awful feeling standing alone, high in air, my shipmates looking on, and craven fear turning me back. Captain ——— shouted "All those women on the shore will laugh at you if you don't go off," and off I went, miles it seemed to me; 20 feet I was sure it was, and my fear over and my pride very great, I asked how high the pile was

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and was told it was 8 feet. I never did believe it and was sorry I had asked.

My first trip to Guantanamo City was an entirely new experience. First, by tug to queer old Caimanera, which I can not describe except as a funny little temporary touring place with Brooklyn contiguous and joined to it by Brooklyn Bridge; I wish I had a picture of this Brooklyn and its bridge to show you. There were funny little Spanish shops with three sides only, closed, the fourth open to the public and in most of which bottle goods were freely displayed.

Silks, embroideries, laces, perfumes, etc., were held before your eyes to tempt you, some salesmen speaking English quite well, others only Spanish, so bartering was not always easy. The water supply was brought in a barrel drawn by a small horse, or in tin cans in a little cart drawn by a goat.

The train from Caimanera to Guantanamo City ran once a day and did not come back. The country we passed through was in many places covered only with cacti, in some places were salt beds, and we saw a few sugar plantations. The small children wore nature's own raiment and nothing else. Arrived in Guantanamo, there were four of us, we crowded into a "sea-going hack," sometimes in better days called a royal victoria, and made for the Hotel Washington, very Spanish, with high grille work, inclosed court, and fountain. We were hungry, but had to guess at what we could eat until an English-speaking waiter could be found. Of course no one dared drink water, and beer and wine not being my accustomed beverage, I felt I must needs go slow; however, my thirst was assuaged with no ill effects, and off we went to the shops. There were some very good ones, and at one especially, La Perla, we received such courteous and able attention that laces and silks and organdies were bought to the extent of our purses.

Having finished our shopping, or at least, spent all our money, we had some time to spare and decided to drive around town until train time. We had ample time to see everything, but our driver, knowing no English, took our "drive around" absolutely literally and drove us round and round one square, part of the time on two wheels, children and chickens scampering in all directions and "Stop! Go this way" meant nothing but "round and round." We got a flying glimpse of the cemetery, a few native huts on the outskirts, a passing glimpse of Spanish ladies at home when the wind blew the draperies aside, but not even to get a snapshot could we stop that mad "round and round." At last, in despair, some one remembered the Spanish for railway station, so off we flew and, thanks be, arrived with no broken bones.

It seemed there as if everyone was smoking cigars; even the women had long black ones in their mouths. As I said before, the train from

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Caimanera left there one day and did not go back until the following, so that night we returned by way of Boqueron, where, while waiting for our boat, we were entertained by a Cuban customs inspector and his family. For fear you may think we were unescorted, I must tell you that Chaplain ——— was our official guide and mentor, but during the shopping tour he had discreetly left us to our own devices, but looked after our safety on the journey home. To go back to our inspector, he insisited on our coming into his home, which was near the dock, introduced us to his little wife, an 18-year-old girl from Jamaica, and his three cunning children. Wine we must and did have, a sweet mild wine, a whole bottle of which was consumed for our refreshment and when, our boat arriving, we bade them good-by and thanked them for their hospitality, the man smiling and bowing low said, "We have been honored in entertaining the daughters of Uncle Sam."

Never in my life before have I spent an entire winter away from snow and cold weather. To have continuous sunshine and clear skies was wonderful: I felt all the time my letters should be dated July and August instead of January and February. On February 12 we left Cuba and started for Panama, but that is a tale by itself.

Coming through the Panama Canal was one of the perfect things that happens once in a lifetime. As we entered that morning at a little after 6 o'clock, on the left, coming out from the underbrush with great long knives in their hands, were six or eight fierce-looking men with swarthy skins and long black moustaches; they looked like brigands, but were, doubtless, natives on their way to cut sugar cane. On the right, almost hidden by greenery at the water's edge was a native dugout, a little boat made from one long log, with the middle scooped out. Every patient that could walk or be carried up above was taken on deck, and the nurses in turn made periodic visits to the few ill ones left below. We spent every possible moment on deck, running from one side to the other for fear we might miss something. The beauty and wonder of it all is past description, and going through in our own great ship with a couple of submarines trailing behind, as though they were stealing a ride, added just that much to the thrill. The perfume of the flowers, the songs of the birds, the marvelous beauty of the varicolored mountain tops rolling away in the distance with the soft beautiful green at their feet! I can just close my eyes and see it all again. Is not it grand to carry a picture like that with you always and that it can not be broken?

Lake Gatun, which is a great valley flooded to the tops of its trees, is beautiful, and almost beyond belief, and the mechanism of the locks beyond my comprehension. My entire trip had been more or less of a dream, but the trip through the canal was a dream within a dream.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Arriving at Balboa, we steamed beyond and anchored well out. We worked hard in Panama, so were too tired and the distance ashore too great to make frequent trips, but we made the most of the trips we did make. At old Panama, I was much suprised to find so little in the way of old structures, but the old bridge, a tower, and the walls and arches of an old monastery and convent were interesting indeed, and one could well believe they were the 300 years old that was claimed for them.

Panama of to-day is to me very interesting and entertaining, for never before have I been in a city, except old Guantanamo, where the shops were mostly owned by Chinese, Spanish, or French. It is all so different from Boston and New York. I liked to poke about, even though I bought little: there is so much that one would not care to buy, but many things are there to tempt one just by their beauty or queerness.

Neither in Panama nor Cuba did we suffer from an excessive heat, except when shut up in the operating room or some close place, for the blowers and electric fans were going constantly and the nights were cool and comfortable. At one time during our stay in Cuba, both the *Mercy* and the *Relief* were so busy and crowded that a detention camp had to be opened on shore.

On March 22, many hearts were really saddened and many an old salt's eyes actually dimmed with tears as the old *Iowa*, controlled entirely by radio, was finally sent to her ocean bed. On March 24 was the greatest display of searchlights that I ever expect to see. Flashing out from the various ships and fortifications, crossing and recrossing each other in great sprays and tendrils of light, quivering and flickering all over the sky, they were like a marvelous display of northern lights.

The trip up the west coast was smooth and uneventful, with land in sight most of the way; it seemed like mountains reaching to the very water's edge. A school of porpoises and now and then a "flock" of flying fish delighted us. I was on night duty part of the way, and the stars were so brilliant and beautiful. About 5 o'clock one morning, I thought an airplane or ship was bearing down upon us, as such a bright light was heading our way. After proclaiming the fact and gathering an audience, I discovered the big bright light was Venus.

We arrived in San Diego about 6 in the morning, transferred our patients to the hospital, and ourselves made a flying trip through the town and to the hospital. At 6 in the evening we left San Diego for San Pedro, where we remained about six weeks, keeping very busy most of the time. The weather was cool for the most part, and after the Tropics, California did not seem so "sunny." From San Pedro we took a week-end trip to Mount Lowe, passing through

Digitized by Google Original from UNIVERSITY OF MICHIGAN

beautiful Pasadena with its orange groves full of fruit and heavy with the perfume of the flowers.

The trip up from San Pedro to San Francisco was another peaceful one. From there one week end we went to San Mateo, and visited the Mills Memorial Hospital, a beautiful, finely-equipped private hospital built by Mrs. Whitelaw Reid in memory of her father and mother. Except for its wards and operating room, it is like some very attractive private home without the least institutional air about it. Three sides look out into a beautiful rose garden, in the center of which is "the little duck baby" as a fountain. Close by is a charming memorial chapel, and a rustic bridge across a deep ravine leads to the nurses' quarters. We drove through the fruitful orchards and rich valleys of San Mateo and adjoining counties, where great estates of all types in all directions were seen, and finished with a trip through Palo Alto and Leland Stanford University buildings and grounds. The chapel with its marvelous mosaics, glorious memorial windows, chancel and altar of white marble, and its fine organ were worth in themselves a long day's journey. One Sunday, we drove out to Santa Rosa, saw the homelike residence of Luther Burbank, himself at the gate, and across the street his experimental gardens.

From Mare Island, five of us took a motor trip via Sacramento and Truckee to Lake Tahoe; we drove 165 miles the first day, arriving at Tahoe Inn at 7 p. m. The next morning after an early breakfast we were on the road again, driving along the shore of the beautiful lake, stopping at its southern end to look back over Tahoe with its chasing shadows, and high green shores. At our feet lay Emerald Bay, a gem of exquisite beauty. This day we spent climbing and descending mountains, beside noisy rushing brooks, with camps everywhere, some evidently being just established, some with a homelike air of continued occupation, while others were being broken up. Some of these camps had very little equipment, and others many of the comforts of home.

Herds of cattle fed in the fertile valleys and even on the mountain tops, and in one great valley between high peaks we came upon a great flock of sheep, which did not fail to have its black member. The shepherd dogs were there with all their canny wisdom, and to my great surprise and delight the shepherd carried a real "Bopeep" shepherd's crook. As we came down into the valley near Woodfords, the road became dry and sandy and the sun hot. A refreshing thunderstorm overtook us, however, and the rainbow following was only one more good omen and thing of beauty.

The short part of the journey through Nevada was mostly among sagebrush and alkali dust, but as this had been followed by our drenching rain, we soon forgot it and enjoyed fully the drive up

Digitized by Google Original from UNIVERSITY OF MICHIGAN

another rough mountain side, then through the valley toward Bridgeport. A coyote dashing away from a brookside and a real mountain pack train with burros, dogs, and men on horseback, added to the unusual sights for us. A steaming brook from the hot springs was one more interesting item, and always we could look up and see snow on the mountains. At Bridgeport we were examined for out-of-State fruit and for the alfalfa weavel, supposed to inhabit Nevada, but we were guiltless of having any stowaways. Then on again up the mountain side, up and up, the elevation of Bodie being something over 8,000 feet, but we did not go to the top; then down gradually, until suddenly coming around a turn to the clear open side of the mountain, Mona Lake lay before us, the volcanic mountains with their crater peaks all about her, with two more for good measure raising their heads in her center, while the setting sun cast a soft rosy glow over all. All the way down the mountain this beautiful, almost oceanlike thing lay before us, and along its side we rode until we reached Tioga Lodge where we had dinner and spent the night. We could not wait for full sunrise the next morning as we had 98 or 100 miles to go that day, so were on our way at 4.45 a. m. This time we had real mountain climbing to do, no tree or shrub to break our fall, should our driver or his good car fail us. Up, up, over, over, we crawled, sheer, massive stone walls above and around us. Lake after lake we passed as we gained high valleys where old snow still lingered and light snows had recently fallen. At 7 a. m. we were at the gate to Yosemite, 9,941 feet above the sea, where we had breakfast.

Then on again, still on the mountain tops, yet through many fertile meadows, and by steady and hard driving we slipped into line for the 1 o'clock control, just as the whistle blew for the procession to start. What a sigh of thankfulness went up that we had not missed it, for this last 4 miles of the trail is so hard, narrow, and dangerous that travelers may go in one direction only, entering from the up side on the odd hours and from the valley side on the even.

Shortly before 2 o'clock we were in the beautiful Yosemite Valley itself. Great mountains on all sides, El Capitan accepting our password at the foot of the Big Oak Flat Road, Pohena Falls waving us a welcome on the right, and Yosemite Falls, with her gentle summer voice, bidding us in on the left. After lunch and a little rest we filled our gas tank and drove to Camp Curry and around the floor of the valley, gazing up at all the great familiar guardians, El Capitan, monarch of all he surveys, Gloria Point, the outlook to all things beautiful, Bridal Veil and Yosemite in dainty summer beauty, and Cathedral Rock with the spires that almost touch heaven.

At 4 p. m. we started up the steep and rough pass to Wowona and the Mariposa Juni, and in two hours were 6,000 feet above the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

sea and in the midst of the giants of the forest, where we spent the night. The road down from the grove was dusty and bad. The sun blazed down, even the wind was hot, no tree, telegraph pole, not a tiny bush to cast a shade, just the little "2 by 4" fence posts. In the scant shade of these were from one to four birds, and in one place a squirrel. As we came into the great fertile valley of San Joaquin, orchards of peach, fig, prune, and olives, and great vineyards of grape stretched farther than the eye could reach, while melons of all sizes, colors, and varieties grew among or between them. But of all this, the great green fields of alfalfa were the most attractive, for in the dry season this is the only thing that spreads a green carpet.

We reached Mare Island that evening and literally came back to earth, for our past four days had taken us far above the earth and had shown us wonderful moving pictures which will remain in our memories for a long time.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The Editor,
U. S. Naval Medical Bulletin,
Bureau of Medicine and Surgery, Navy Department,
Washington, D. C.

For review.

Books received for review will be returned in the absence of directions to the contrary.

GERIATRICS, A TREATISE ON THE PREVENTION AND TREATMENT OF DISEASES OF OLD AGE AND THE CARE OF THE AGED, by *Malford W. Thewlis, M. D.*, with introductions by *Abraham Jacobi, LL. D., M. D., and I. L. Nascher, M. D.* Second Edition. C. V. Mosby Co., St. Louis, Mo., 1924

Geriatrics is the branch of medicine dealing with old age and it is a subject which is beginning to interest the medical profession, just as pediatrics aroused the curiosity of certain practitioners seventy years ago. The name, geriatrics, was given to this specialty by Dr. Ignatz L. Nascher of New York, who contributes an introduction to this volume, and in his textbook on "Diseases of Old Age" which appeared in 1914, he enunciated three fundamental principles upon which geriatrics is based: (1) That senility is a physiologic entity like childhood and not a pathologic state of maturity; (2) that disease in senility is a pathologic condition in a normally degenerating organ or tissue and not a disease such as we find in maturity, complicated by degenerations; (3) that the object of treatment in senility should be to restore the diseased organ or tissue to the state normal to senility and not a restoration to the condition normal in maturity.

Starting with these principles Doctor Thewlis narrates in a pleasing manner his experience with disease as it occurs in the aged. The correct interpretation of senile pathology, according to the author, requires a knowledge of normal anatomic and physiologic changes. In old age anatomic changes occur in every organ and tissue of the body. The essential change is a waste of tissue which is either not repaired at all or is replaced by tissues of a different character. As

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

a result of these changes the functions of the organs and tissues are altered and we find lessened activity, altered activity and loss of the harmonious interrelation between associated functions. Organs and tissues being in a process of degeneration and their functions impaired in the aged, when they become diseased, the pathologic and functional changes are different from the changes that occur in the same disease in earlier life and the symptoms and signs are different. Some diseases are peculiar to the senile organism, others are so greatly modified that they are hardly recognizable in the altered symptoms and signs. The treatment of disease in the aged, the author emphasizes, must always be based on Nascher's third principle—restoration to the norm of senility, not to the norm of maturity.

Early in the book we find an entertaining chapter on the value of old age, in which the author brings in review a host of eminent persons whose greatest work was accomplished after they had reached the age of 60.

A French philosopher once said that a man should keep at his work as though immortal, even if he should know that his death would come the next day, and the author points out the fact that to keep at work in an interesting occupation is in reality the keynote of obtaining the best there is in old age.

Should an aged person become ill he should be kept out of bed as much as possible. Inactivity in the aged predisposes to toxemia either of renal or intestinal origin, and the author gives several examples of cases in which serious abnormalities disappeared when the patient was forced out of bed. There also is a psychic element to combat under these conditions. When old persons are ill in bed they feel that their end is approaching and "old age" stares them in the face. "Old age" to them is a death warrant.

Constipation is an important factor in old age and proper attention to the intestines solves one of the greatest problems of geriatrics. The author outlines the treatment which he has found to be most successful, and he discusses the question of diet suitable to old age, in health and in disease.

There are chapters dealing with blood pressure in senile cases, arteriosclerosis, senile heart and kidney disease, senile diabetes, senile rheumatism and prostatic hypertrophy. Affections of the lungs such as asthma, emphysema, bronchitis, pneumonia, and influenza, are fully considered.

Much space is devoted to the subject of therapeutics, which in the aged differs materially from that of maturity. Diagnostic errors in the aged likewise receive much attention.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Two important chapters deal with the senile climateric and sexual life in the aged. The volume closes with chapters on radium therapy in senile cases and surgical procedures in the aged.

The author has taken advantage of the publication of the second edition of this book to add several new chapters to the work, the most important of which are those on electrotherapy, organotherapy, senile heart disease, asthma, emphysema, influenza, puritis senilis, and hepatic cirrhosis.

The volume should prove of great value to the general practitioner who to-day must undertake the treatment of the diseases of the aged, although the author predicts that in time, perhaps, geriatrics will be a well-recognized specialty and that clinics will be established for the study of senile disease, since the diseases of old age require as much special attention as diseases of children.

INTRAVENOUS THERAPY, ITS APPLICATION TO THE MODERN PRACTICE OF MEDICINE. by *Walton F. Dutton, M. D., medical director, Polyclinic and Medico-Chirurgical Hospitals, Graduate School of Medicine, University of Pennsylvania.* F. A. Davis Co., Philadelphia, 1924.

Intravenous therapy includes all therapeutic efforts brought to bear directly upon the blood stream, and properly embraces venesection, transfusion of whole or modified blood, and the introduction of saline or other tonic solutions into the circulation, as well as medication by the intravenous route.

The history of blood transfusion for therapeutic purposes, and the intravenous injection of drugs, dates from the seventeenth century and it is pleasing to note that the author of this book begins his treatise with an exceedingly readable historical outline of the subject, tracing the steps of progress in this special branch of therapeusis from the hazy record in the writings of Andreas Libavius, published at Frankfort in 1615, to the work of Huston, Weil, Lewisohn and Agote, who, working independently of each other, demonstrated the feasibility of the sodium-citrate method of indirect blood transfusion in 1915.

The subject matter proper is considered in two parts:

Part I embraces the discussion of the general technic of intravenous therapy. Here the author considers in a very practical manner the details of venesection, infusion of physiological salt solution, blood transfusion both by direct and indirect methods, the special application of blood transfusion and its damages, intravenous therapy in pediatrics, the general technic of intravenous injection, the use of arsphenamin and allied arsenicals and intravenous anesthesia.

Part II is a compilation of matter relating to those conditions where treatment by venesection, blood transfusion, and intravenous medication, either separately or in combination, has proven effectual.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The diseases considered by the author are arranged in alphabetical order, commencing with acidosis and ending with yellow fever.

An appendix contains rules for comparing thermometric scales, a table of approximate measures, a table for making solutions, tables of metric equivalents and, most important, a dose table giving the intravenous dosage of the drugs employed in this manner.

The first portion of the book is profusely illustrated by photographic reproductions of the various processes, manipulations, and apparatus concerned in intravenous therapy.

As intravenous therapy offers a number of advantages over other known methods of administering remedial agents and as this book contains what is known to date of the subject, it should be of great value to both the general practitioner and the specialist.

LABORATORY DIAGNOSIS OF SYPHILIS, by *Hideyo Noguchi, M. D., M. S., Ph. D., D. Sc., member of the Rockefeller Institute for Medical Research, New York.* Paul B. Hoeber, New York, 1923.

The present edition of Doctor Noguchi's book is a revised edition of his former work entitled the "Serum Diagnosis of Syphilis," and as such is a valuable aid in the laboratory procedures which make for an accurate diagnosis of syphilitic infections. The author groups the laboratory procedures into the (1) detection of the causative organism and (2) the detection of certain pathological changes in the body due to invasion by the organism.

The first chapter deals with the biological and biochemical procedures for detecting indirectly the presence of syphilitic infection. The principles dealing with serological procedures, that of giving an elementary presentation of the factors relating to hemolysis and complement fixation as applied to the serum diagnosis of syphilis are essentially the same as presented in the author's previous work, the third edition of which appeared in 1912. After a period of 10 years none of the fundamental procedures originally outlined have been changed. The Noguchi system is now well established, notwithstanding the alleged technical difficulties and attempts of various investigators to introduce a variety of modifications. The hemo-hemolytic system for the serum diagnosis of syphilis introduced by the author to be used where guinea-pig serum is not available is thoroughly covered by a chapter and presents an excellent review of the work of others.

Methods are presented for the quantitative determination of the antibody content of syphilitic serum and spinal fluid, enabling the investigator to determine the intensity of the reaction by titration. The latter is of prognotic value in indicating the effect of treatment.

The chapter on luetin reaction has been considerably abbreviated, although the author maintains his early view regarding its diag-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

nostic value in certain chronic cases of syphilis in which the Wassermann reaction is indecisive.

The tests of Bruck, Sachs and Georgi, Meineke and others, based on the precipitation of certain protein fractions in the syphilitic serum with lipoid extracts are described.

Demonstration of the *Treponema pallidum* and allied organisms are most clearly set forth in a chapter on dark field microscopy. It is undoubtedly the most instructive description of the dark field apparatus ever written, and the directions for its manipulation will be found a most comprehensive and valuable reference work. The staining of the causative pallidum in smears and tissues by various analine dyes and silver impregnation methods are enumerated, including a new method devised by Miss Tilden, the author's assistant, which makes it possible to stain the Treponema with ordinary analine basic dyes.

The various tests for increased protein or cellular content of the spinal fluid essential in the diagnosis of syphilitic affections of the central nervous system, include the butyric acid test, Amoss's phosphate solution test and other methods, including Lange's colloidal gold reaction. A new procedure has been added based on the flocculation of lipoids.

The illustrations are beautifully presented, especially those dealing with dark field illumination and photomicrographs of the *Treponema pallidum* in smears and tissue preparations.

The volume lives up to the reputation of the author and should be considered as one of the classics for the serologist and an entirely comprehensive textbook for the beginner in serum diagnosis.

GENITOURINARY DISEASES AND SYPHILIS, by *Henry H. Morton, M. D., F. A. C. S., professor of genitourinary diseases and syphilis in the Long Island Medical College, and genitourinary surgeon to the Long Island College Hospital and Polhemus Memorial Clinic*. Fifth edition. Physicians & Surgeons Book Co., New York, 1924.

This book admirably reflects the author's practice at the Long Island College Hospital and his teachings in the college. In it the entire field of modern genitourinary surgery is adequately covered.

In the preparation of the present edition the author has called to his aid certain members of the staff of the Long Island College Hospital. Dr. Archibald Murray, professor of pathology, describes the gonococcus and the staining methods used for its detection, and gives a synopsis of the laboratory procedures in everyday use for the urologist.

Dr. Carl H. Laws, professor of pediatrics, has outlined the treatment of congenital syphilis in infants and children used in his clinic and Dr. Alfred C. Beck describes the methods of treating pregnant women infected with syphilis.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Dr. Alfred Potter, professor of dermatology, has written the chapter on the Wassermann reaction and its clinical relations.

Dr. Louis C. Johnson, assistant professor of medicine, has written the chapter on blood chemistry and Dr. Albert M. Judd, attending gynecologist and obstetrician to the Kings County Hospital, the chapter on gonorrhea in women.

The author begins the book with a discussion of the urine, tests of kidney function, blood chemistry, radiography, pyelography, cystoscopy, and urethroscopy. He then proceeds in a systematic manner to consider the diseases of the genitourinary tract. The last 10 chapters are devoted to syphilis.

The book is replete with photographic reproductions and colored plates. An appendix contains some practical suggestions for office work, including a list of instruments required, instructions for patients, laboratory methods, and charts in use at the Long Island College Hospital.

QUANTITATIVE ANALYSIS, CONTAINING THEORY, LABORATORY DIRECTIONS, PROBLEMS, EXPLANATIONS OF CALCULATIONS AND SPECIAL TOPICS IN ANALYTICAL CHEMISTRY, by *Stephen Popoff, Ph. D., acting head of analytical chemistry, State University of Iowa.* P. Blakiston's Son & Co., Philadelphia, 1924.

This book is not a treatise on quantitative analysis as that subject is generally understood but it is a set of notes for the guidance of students in the laboratory.

As the author states in his preface his object in writing the book has been threefold: "First, to incorporate in a single book the theory, laboratory instructions, problems, and explanations for the calculations of these problems; second, to emphasize the law of mass action and the theory of equilibrium to quantitative reactions; third, to incorporate some of the more recent advances in analytical chemistry."

The author has introduced explanatory notes covering theory and practice in convenient places in the laboratory directions so that the student will know what he is doing and why he is doing it according to the method given.

The subject matter is considered in four sections. In Part I the theory of analytical chemistry is presented. Parts II and III contain notes on the ordinary laboratory procedures concerned in analysis. Special topics in analytic chemistry, together with laboratory instructions for a course in electrometric titration are given and discussed in Part IV.

To the student this little volume will be of great value when supplemented by lectures in general and physical chemistry and reference to more comprehensive books on those subjects as well as reference to more complete works on quantitative analysis.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

PRACTICAL CHEMICAL ANALYSIS OF BLOOD, by *Victor Caryl Myers, M. A., Ph. D., professor and director of the department of biochemistry, New York Post-Graduate Medical School and Hospital.* Second edition. C. V. Mosby Co., St. Louis, 1924.

This volume is the second edition of a book of the same title published in 1921, which, in turn, is a revision and elaboration of a series of articles on "Chemical changes in the blood in disease" printed in 1920 in the Journal of Laboratory and Clinical Medicine. The volume is well written, well printed and bound, and contains detailed descriptions of almost all the techniques commonly employed in the modern blood-chemistry laboratory. The author adheres strictly to his text with the single exception of a short chapter on "Quantitative micromethods of urine analysis," and, accordingly, the text is not burdened with considerations of morphology, blood counting, and the like.

A short discussion of the methods of taking and preserving blood for chemical analysis is followed by a consideration of each of the individual substances of known clinical significance contained therein. The author devotes two or three paragraphs of large type to a general discussion of each substance, then gives in small type the approved method or methods for its estimation, and, at the end of each section of text, includes his bibliography. The volume contains a number of illustrations of apparatus and several charts and tables.

The new edition contains a separate chapter on the "Folin-Wu system of blood analysis" and a new chapter on miscellaneous determinations, such as hemoglobin estimations, oxygen capacity and content, calcium, inorganic phosphates, and acetone bodies.

The book is a handy source of reference, not being overburdened with detail and might well find a place on the desk of any person who performs or makes use of chemical blood analysis.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Digitized by Google

Original from
UNIVERSITY OF MICHIGAN

THE DIVISION OF PREVENTIVE MEDICINE

Lieut. Commander J. R. PHELPS, Medical Corps, United States Navy, in charge

Notes on Preventive Medicine for Medical Officers, United States Navy

STUDIES OF SUBMARINE VENTILATION IN TROPICAL WATERS

By R. F. JONES, Lieutenant Commander, and G. H. MANKIN, Lieutenant, Medical Corps, United States Navy

In this investigation of submarine ventilation it was decided to make the first study on the "R" type of boats, as they have the most modern type of ventilating system of any of the submarines based on Coco Solo, Canal Zone. The U. S. S. *R–23* was used for all the experiments discussed below.

Before entering upon these experimental studies we made every effort to familiarize ourselves with the mode of living and conditions in general on board submarines during various phases of operation. This was done by taking frequent surface and submerged runs from the submarine base, Coco Solo, on various types of submarines.

To enable us to collect data concerning conditions aboard submarines of the R type when submerged and to first calibrate instruments, a 10-hour dive was made during which the temperature, wet and dry kata-thermometer readings, psychrometer readings, oxygen and carbon dioxide percentages, and barometric pressures were recorded at hourly intervals. In addition, we carefully noted comfort conditions and how the personnel was affected. This will be found under remarks in the tables.

A brief description of the instruments and methods of recording the data obtained may not be amiss. The kata-thermometer, by means of which the cooling power and comfort index may be readily determined, is an instrument designed primarily for the measurement of its own rate of cooling when its temperature approximates that of the human body. It consists of an alcohol thermometer with a cylindrical bulb about 4 cm. long and 2 cm. diameter, and a stem 20 cm. in length graduated in tenths of a degree Fahrenheit from 95° to 100° F. The stem terminates in a small reservoir

Digitized by Google Original from UNIVERSITY OF MICHIGAN

which serves the double purpose of acting as a safety overflow reservoir in case of accidental overheating of the bulb, and of enabling the instrument to be heated well above the point at which observation has to be made, in order to give time for transferring it to a suitable position for reading, and also to insure that, by then, it has settled down to a regular rate of cooling. The distance of the top graduation mark from the reservoir is about 13 cm. For the purpose of taking wet readings the bulb is covered with a muslin "glove." The finger stall of a "lisle thread" glove is used. This is cut long enough to draw up well above the bulb of the kata. After heating in hot water until the spirit rises into the top reservoir, superfluous water is removed by drawing up the glove tightly, and giving the instrument, held vertically, one or two shakes downward.

Before adopting this instrument for observations of this type it was thoroughly investigated by one of us (R. F. J.) at the United States Naval Medical School and we are convinced that complete reliance can be placed in it. In fact, we are of the opinion that the kata-thermometer, wet and dry, particularly the wet, gives a much fairer index of the ventilation and comfort conditions in a closed or open compartment than any other instrument of which we have knowledge. Furthermore, we are convinced that a curve plotted from the readings of the wet kata-thermometer will give direct evidence of the comfort conditions when compared with a cooling power of approximately 18 milicalories per sq. cm., which is the ideal for England and the United States, and from 15 to 18 in this locality under similar conditions. The wet kata-thermometer is so sensitive that it will give a better index of conditions and will present it in a much more apparent manner than the psychrometer. Since performing these experiments we are all the more firmly convinced that it was only necessary for us to use the wet and dry kata-thermometers to obtain the ventilation and comfort indices of the various compartments of the submarine when submerged for not more than 17 hours. Because of the fact that so much credence has been placed in the wet and dry bulb psychrometer and since vapor pressures worked out by the psychrometer and the kata-thermometer may be checked against each other, we considered it advisable to use both instruments. In this connection it may be stated that not only the cooling or heating power of the atmosphere may be obtained from the combined readings of the wet and dry kata-thermometer, but also the vapor pressure and velocity of the air movement may be calculated, whereas from the psychrometer only the vapor pressure may be determined.

In this report, we will express humidity as vapor pressure rather than as relative humidity because the latter is a very confusing term and is liable to such wide variation, and fails to express, without constant references to the temperature, the true humidity conditions.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

For example, air of 25 per cent relative humidity at a temperature of 55° F. dries the skin and mucous membranes in an unpleasant manner; but if the same air is maintained at 25 per cent relative humidity and is raised to 85° F., it has an agreeable effect upon the skin and mucous membranes. The explanation of this is that at 55° F. air can hold only 5 grains of moisture per cubic foot when fully saturated. Twenty-five per cent relative humidity, then, gives only 1¼ grains of moisture per cubic foot of air, which is too dry for the skin and mucous membranes. The vapor tension of such air is about 2.8 mm. of mercury. At 85° F. the capacity of the air is about 12.5 grains per cubic foot and with 25 per cent relative humidity it would contain over 3.1 grains per cubic foot and have a vapor tension of about 7.9 mm. of mercury as compared with 1.25 grains and 2.8 mm. of mercury for the same relative humidity (25 per cent) at 55° F.

In so far as the ventilation of houses and surface craft is concerned we are thoroughly in accord with Dr. Leonard Hill of the Medical Research Council, London, England; Dr. C. E. A. Winslow of Yale University and formerly a member of the New York State Commission on Ventilation; and many others who have investigated this and similar subjects, and who hold that the ill effects resulting from vitiated atmosphere are not due to an increase of carbon dioxide nor to a diminution in oxygen, but rather to the effects of temperature, humidity and the movement of the air. Nevertheless, in any investigative work on submarine ventilation the oxygen and carbon dioxide must be taken into consideration. The reason for this is that submarines when submerged are completely closed compartments, and as the result of human habitation, the percentage of carbon dioxide will rise and that of oxygen diminish. But as is shown in Navy Department publications, the oxygen and carbon dioxide percentages do not have to be considered until 17 hours have elapsed. This matter has been studied so completely by Commander E. F. DuBois, Medical Corps, United States Naval Reserve Force, and Lieut. Commander E. W. Brown, Medical Corps, United States Navy, it will not be necessary to go into it here except with a view to proving that the decrease of oxygen and increase of carbon dioxide have no ill effects up to the limit established by Commander DuBois and Lieut. Commander Brown. It will be noted that in these experiments such limits were never reached and so far as we could observe the diminution of oxygen and the increase of carbon dioxide had absolutely no effect upon respiration, pulse, or in fact, in any way, upon any of the personnel. The extreme for carbon dioxide was 2.50 per cent and for oxygen, 18.42 per cent, figures which are well within the limits allowed by the Navy Department.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Barometric pressures were taken concurrently with the other determinations because of the relationship which they bear to the moisture, carbon dioxide, and oxygen content of the air, and also for the possible effect it may have on personnel and the kata-thermometer cooling power. At no time did we find that the barometric pressure was sufficiently high to have an appreciable effect upon the readings of the instruments with the exception of the psychrometer. However, since it was felt that the barometric pressure might have effects other than upon the psychrometer readings, we frequently included the barometric pressure in our calculations but at no time did we find that the small increase in barometric pressure had any appreciable effect upon the other calculations.

Since, in a submerged run, the only method of elimination of heat from the boat is by conduction through the hull of the ship to the outside water and the air ventilating lines passing along under the superstructure, it is essential that the temperature of the outside water be taken into consideration. Consequently, the temperature of the outside water was taken at approximately the same time as the other observations. The temperatures were taken from 30 to 100 feet below the surface of the water, depending upon the depth of the submarine. It was found that the variation in temperature was surprisingly small. The dry-bulb temperature of the air inside the boat was taken at as near the same time as possible as the outside water temperature in order that a comparison might be made between the two. We were very much surprised to note that there was only a difference of from 3° to 5° between the inside air temperature and the outside water temperature: yet, this difference seemed sufficient to eliminate heat rapidly enough to prevent any great discomfort, except when the galley range was in use and during the latter part of the run when the motors were becoming hot. In other words, it would seem that the difference in temperature is sufficient to care for the heat eliminated by the personnel. It must be borne in mind that this heat elimination was assisted by the forward motion of the submarine, 3 knots per hour, which prevented the formation of an envelope of heated water about the boat. In the motor room, where the most heat was generated, and in the after battery compartment, when the galley range was in use, the outside water was not sufficiently cool to absorb the heat from the hull of the ship rapidly enough to prevent an overheating of those compartments. On the surface runs, it was noted that where a considerable portion of the ship is out of the water and the sun's rays were beating down upon the hull, the inside temperatures were higher than during the night when the cooler air outside could assist the water in the dissemination of the heat from the boat.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

FIRST EXPERIMENTAL RUN

The first experimental run began at 7 a. m. September 27, 1923. The U. S. S. *R–23* cleared the breakwater off Coco Solo, Canal Zone, and the submerged run began with a crash dive at 7.27 a. m. Before leaving the dock, the weights of the personnel, of all provisions, and of drinking water were carefully taken, a set of scales having been provided for that purpose. At the end of the run the weights were again taken with a view to ascertaining the weight change in the personnel and the weight of the food and water consumed. The total weight of the personnel upon going on board was 3,757⅞ pounds; the weight of the food and water consumed by the personnel was calculated as being 180⅝ pounds; the weight of the personnel at the end of the run was 3,789¼ pounds. The weight of the dejecta was 5½ pounds. From this it may be seen the net loss in weight of the personnel was 142½ pounds, or an average of approximately 5¼ pounds per man. This loss of weight was largely due to the loss of water through the skin and lungs. None of the men did any hard physical work during the dive. While accurate methods were not at hand for measuring the amount of heat given off by the personnel to the surrounding atmosphere in the submarine, it is apparent that the amount is larger than is ordinarily considered to be derived from this source.

Pulse rate, temperature, and the respiration rate of the personnel were taken at various stages of the run, and no appreciable deviations from the normal were noted.

In order to get complete data regarding all parts of the boat, observations with the several instruments were made in each individual compartment. By reference to the tables, labeled "First experiment, September 27, 1923," it will be noted that the general trend of the curves in each compartment was more or less similar, although in some compartments as was to be expected, such as the motor room, and the after battery compartment where the cooking took place the curves were more markedly affected. Comfort conditions in each compartment gradually became worse during the dive; the humidity, expressing it as vapor pressure, gradually rose to practically complete saturation. The charts made from this experiment seem to demonstrate that the decreased comfort conditions resulted from the inability of the boat to rid itself, through the skin of the ship, of the contained heat which was constantly being augumented by the personnel, batteries, and machinery, and also because of the fact that there were no means of decreasing the moisture content of the air in the boat, which, as shown by the psychrometer readings, gradually increased to saturation. Neither the oxygen content nor the carbon dioxide content was sufficiently changed to account for the discomfort which was felt in the boat.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

We have made ourselves sufficiently clear in the column for remarks in the tables to make it unnecessary to make further reference to the conditions in so far as they affected the personnel in each of the compartments. Attention is directed particularly to conditions in the after battery compartment, engine room, and motor room. In the after battery compartment the use of the galley range seemed to have a very marked effect, not only upon the men but also upon the wet kata-thermometer. It was also observed by us that the number of men in a compartment had an appreciable effect upon the wet kata-thermometer. The comfort conditions as they were actually experienced by us and recorded under remarks, agree very closely with the effect upon the wet kata-thermometer and the resultant curve.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

First Experiment, U. S. S. "R-23," September 27, 1923

Table No. 1.—*Torpedo room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	83. 0	80. 25	84. 00	26. 03	7. 06	2. 68	0. 090	Fairly comfortable.[1]
SUBMERGED RUN								
First hour	84. 0	82. 50	85. 00	28. 91	6. 90	2. 45	. 087	Fairly comfortable.[1]
Second hour	85. 0	83. 00	85. 00	29. 44	6. 34	2. 47	. 137	Do.[1]
Third hour	84. 5	83. 50	85. 00	30. 26	6. 74	2. 09	. 040	During past hour gradual decline in comfort.[1]
Fourth hour	84. 5	83. 00	85. 00	30. 01	6. 57	2. 16	. 053	Continues to be fairly comfortable.[1]
Fifth hour	85. 0	83. 50	85. 00	30. 65	6. 49	2. 16	. 122	Little change in comfort.[1]
Sixth hour	84. 6	83. 50	85. 25	30. 83	6. 38	2. 26	. 076	Less comfortable than previous hour.[1]
Seventh hour	85. 0	83. 50	85. 25	31. 59	6. 20	1. 72	. 016	Comfort conditions slightly improved.[1]
Eighth hour	85. 0	83. 50	86. 00	31. 58	6. 46	2. 35	. 106	Comfort conditions worse than previous hour; galley range started.[1]
Ninth hour	85. 0	83. 75	85. 00	31. 78	5. 80	2. 19	. 076	Conditions much less comfortable.[1]
Tenth hour	85. 0	83. 75	85. 00	32. 18	5. 34	2. 25	. 087	Less comfortable but not very uncomfortable.[1]

[1] Considering circumstances.

Original from UNIVERSITY OF MICHIGAN

TABLE NO. 2.—*Forward battery compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	87. 8	81. 50	85. 25	26. 92	7. 52	2. 23	0. 276	Comfortable.[1]
SUBMERGED RUN								
First hour	85. 2	83. 50	85. 25	29. 95	6. 84	1. 94	. 037	Fairly comfortable.[1]
Second hour	85. 5	85. 00	87. 00	31. 38	6. 53	1. 90	. 040	Conditions less comfortable.[1]
Third hour	86. 5	85. 00	87. 50	31. 68	6. 26	1. 87	. 059	Comfort conditions only fair.[1]
Fourth hour	86. 0	85. 00	87. 25	31. 98	5. 79	1. 74	(?)	Uncomfortably warm due to batteries heating up.
Fifth hour	87. 0	85. 00	87. 25	32. 29	5. 91	1. 68	. 040	Little change.
Sixth hour	87. 0	85. 00	87. 50	32. 29	6. 17	1. 72	. 047	Comfort conditions improved.[1]
Seventh hour	86. 0	85. 25	87. 25	33. 28	5. 97	1. 76	. 030	Little change.
Eighth hour	87. 0	85. 25	87. 50	33. 47	5. 87	1. 66	. 037	Fairly comfortable; not much perspiration.[1]
Ninth hour	86. 5	85. 00	87. 25	33. 50	5. 81	1. 80	. 046	No change.
Tenth hour	86. 0	85. 00	87. 00	33. 51	5. 96	1. 81	. 038	Little change in comfort; apparently cooking in after battery has little effect on the comfort.[1]

[1] Considering circumstances.

Barometric pressures taken concurrently with above figures: 29.2, 29.3, 30.9, 31.2, 31.5, 31.8, 32.0, 32.6, 32.6, 32.9, 33.2.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Central operating compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	87. 5	83. 00	86. 50	31. 31	7. 33	2. 12	0. 164	Comfortable.[1]
SUBMERGED RUN								
First hour	85. 5	85. 50	88. 00	31. 92	5. 81	1. 76	-------	After closing hatch air rapidly became warm, but not very uncomfortable.[1]
Second hour	88. 2	85. 50	89. 00	31. 90	5. 81	1. 62	. 095	Little change in comfort conditions.[1]
Third hour	88. 5	86. 25	89. 50	32. 96	5. 96	1. 55	. 080	Do.[1]
Fourth hour	88. 2	85. 50	88. 50	32. 42	6. 37	1. 50	. 053	Compartment more comfortable.[1]
Fifth hour	89. 5	86. 50	89. 50	33. 80	5. 76	1. 65	. 099	Compartment less comfortable.[1]
Sixth hour	89. 2	86. 50	89. 50	33. 79	6. 22	1. 52	. 131	Compartment fairly comfortable.[1]
Seventh hour	89. 5	86. 50	90. 00	34. 62	5. 82	1. 48	. 107	From seventh hour to end of dive comfort conditions gradually became worse; however, at no time did compartment become very uncomfortable; this was probably due to cooking in after battery compartment; little sweating occurred.
Eighth hour	90. 0	87. 00	90. 00	36. 32	5. 66	1. 38	. 182	
Ninth hour	89. 5	87. 50	90. 50	36. 30	5. 49	1. 38	. 063	
Tenth hour	90. 0	87. 50	90. 00	36. 30	5. 02	1. 38	. 117	

[1] Considering circumstances.

Before dive, O_2, 20.94 per cent; CO_2, 0.16 per cent.
Fifth hour, O_2, 20.30 per cent; CO_2, 0.660 per cent.
Seventh hour, O_2, 19.80 per cent; CO_2, 1.060 per cent.
Eighth hour, O_2, 19.52 per cent; CO_2, 1.25 per cent.
Ninth hour, O_2, 19.50 per cent; CO_2, 1.31 per cent.
Tenth hour, O_2, 19.32 per cent; CO_2, 1.65 per cent.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 4.—*After battery compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	92. 0	84. 00	89. 23	28. 88	7. 98			Comfortable; [1] men weighing in.
SUBMERGED RUN								
First hour	91. 5	86. 50	90. 50	32. 82	5. 88	1. 34	0. 210	Warm but comfortable; [1] inboard ventilation.
Second hour	91. 0	86. 75	91. 50	33. 20	6. 63	1. 14		Comfortable; [1] practically no air movement.
Third hour	93. 0	86. 50	91. 50	33. 35	6. 60		. 309	Galley range started; slightly uncomfortable; [1] cooking smells.
Fourth hour	90. 5	87. 00	91. 00	34. 05	5. 79	1. 10		Galley range in use; slightly uncomfortable.[1]
Fifth hour	91. 0	86. 75	91. 75	34. 17	6. 41	1. 21	. 051	Galley range not in use; slightly uncomfortable.[1]
Sixth hour	90. 0	87. 00	91. 50	34. 37	5. 59		. 044	Stuffy; engine room and battery smells.
Seventh hour	90. 5	87. 00	91. 00	35. 20	6. 67			Do.
Eighth hour	90. 5	87. 50	92. 50	36. 01	6. 27	0. 81		Rather oppressive; galley range in use.
Ninth hour	92. 0	88. 00	93. 00	36. 89	5. 59	0. 72		Uncomfortable; galley range in use.
Tenth hour	92. 50	88. 00	91. 50	36. 91	4. 99			Not so uncomfortable.[1]

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE NO. 5.—*Engine room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	93. 0	85. 50	94. 00	30. 01	7. 93			Underway on both engines; comfortable.[1]
SUBMERGED RUN								
First hour	94. 0	87. 50	95. 00	34. 02	3. 83	0. 340		On motors; fairly comfortable.[1]
Second hour	93. 0	87. 50	95. 00	33. 93	3. 75	. 207		Fairly comfortable.[1]
Third hour	94. 0	87. 25	96. 00	33. 87	5. 36			Fairly comfortable;[1] cooking smells from galley.
Fourth hour	93. 0	87. 25	95. 00	34. 78	5. 49	. 187		Fairly comfortable.[1]
Fifth hour	90. 5	88. 00	95. 25	35. 52	5. 23			No change.
Sixth hour	91. 5	88. 00	95. 00	35. 44	3. 38	. 185		Slightly uncomfortable.
Seventh hour	92. 0	88. 25	95. 75	36. 60	5. 21			Do.
Eighth hour	92. 5	87. 50	94. 75	35. 99	5. 04	. 171		Fairly uncomfortable.
Ninth hour	93. 0	87. 50	94. 50	36. 24	4. 53			Do.
Tenth hour	93. 75	87. 50	93. 50	36. 26	4. 62			Uncomfortable.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 6.—*Motor room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury	Kata cooling power		Wind velocity (M per second)	Remarks
		Wet	Dry		Wet	Dry		
Before dive	92. 0	84. 50	90. 50	29. 35	7. 11	1. 150	0. 160	Fairly comfortable.[1]
SUBMERGED RUN								
First hour	92. 0	87. 00	91. 00	33. 47	5. 77			Stuffy.
Second hour	91. 5	88. 00	91. 75	34. 56	6. 44			Rather uncomfortable.
Third hour	91. 0	86. 50	93. 50	34. 90	6. 11	1. 140	. 063	Do.
Fourth hour	93. 0	87. 00	94. 00	34. 02	6. 39			No air movement. Stuffy.
Fifth hour	91. 5	87. 00	95. 00	34. 32	5. 59	. 618		Uncomfortable.
Sixth hour	92. 0	87. 00	95. 00	34. 31	5. 51	. 478		Perspiration marked.
Seventh hour	93. 25	87. 50	96. 00	35. 97	4. 87			Do.
Eighth hour	94. 0	87. 00	95. 00	35. 22	4. 25	. 263		Uncomfortable.
Ninth hour	95. 0	87. 50	96. 00	36. 23	3. 79	. 211		Do.
Tenth hour	95. 0	87. 00	95. 00	35. 62	4. 17			Very uncomfortable.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

SECOND EXPERIMENTAL RUN

The second experiment was performed with a view to simulating a war patrol as nearly as possible. It will be remembered that in the first experiment the submerged run began with the boat cool, which condition would rarely obtain in actual war patrols. The U. S. S. *R-23* left its dock at 10 p. m. October 9, 1923, proceeded well outside of the breakwater, Coco Solo, Canal Zone, and commenced charging batteries, which continued until 5 a. m. October 10, when a crash dive was made. The ship remained submerged during the daylight hours, crusing at 3 knots' speed, the depth under water ranging from 35 to 120 feet.

Since we felt that we had obtained all the necessary information relative to the physical changes occurring in each individual, such as weight change, pulse, respiration, etc., during the first experiment, it was not deemed necessary to repeat these observations during the second one.

As stated before, this experimental run differed from the first, in that it consisted of two phases, a surface phase, during which batteries were charged, and a submerged phase, during which a speed of 3 knots was maintained. Inasmuch as the temperature, humidity, and cooling power of the air varied so markedly in the two phases, as shown on the following charts, it is considered advisable to discuss each phase separately.

SURFACE PHASE

Torpedo room.—The comfort curve or the wet kata-thermometer curve gradually fell from 10.20 to 6.60. After the first hour the vapor pressure remained more or less constant. From six to eight men were sleeping in this compartment during this period. At no time were they particularly uncomfortable.

Forward battery compartment.—By reference to Table No. 8 it will be noted that the comfort curve was irregular. As mentioned previously, in studying the condition of the air affecting such a curve three factors must be taken into consideration, i. e., vapor pressure (humidity), temperature, and movement of air. Here it will be seen that the vapor pressure seemed to have the most marked effect upon comfort conditions. Unquestionably, the changes in the ventilating system noted under remarks in tables had some effect on the movement of the air as shown in the fourth hour.

Central operating compartment.—Inasmuch as the engines produce a considerable current of air in the after part of this compartment as a result of drawing the air down the conning-tower hatch, all instruments were placed outside of the direct current of air. However, we observed that the operation of the engine had a decided effect upon the comfort conditions in all parts of the central operat-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ing compartment. This is substantiated by the data obtained, for it will be noted in Table No. 9 that comfort conditions were worse during the third, fourth, and fifth hours, and to a lesser extent in the sixth hour, when only one engine was run continually, on charge, and the other on the propeller, occasionally, to maintain position. The wind velocities as recorded by us in meter per second verify the previous statement.

After battery compartment.—The variations in the cooling power curve in this compartment may be accounted for by the changes among the three principal factors—temperature, vapor pressure (humidity), and movement of air. In battery compartments one has to consider, during the time of charging, the effect of increasing battery temperature and evaporation from batteries, in explaining variations in the comfort curve. The use of the galley range also has a marked effect upon the comfort curve, as does to a lesser degree the number of men in the compartment.

Engine room and motor room.—While the temperatures and vapor pressures recorded were quite high, there was not the discomfort that was expected. When these figures are compared with conditions reported as existing in surface craft in the tropics, it will be seen that the engine and motor rooms in submarines under similar conditions can not be considered as being particularly uncomfortable.

Owing to the slow rate of cooling of the dry kata-thermometer, it was impossible to obtain accurate data with this instrument, from which is calculated the wind velocities.

In Park's "Public Health and Hygiene," Winslow states that "according to Professor Cadman exertion begins to be accompanied with depression from a wet bulb temperature of about 77° F. At 82° F. wet bulb, if clothes be removed and maximum body surface exposed, work can be done providing a current of air is available. At 85° F. only light work is possible, and at 95° F. work becomes out of the question." Our observations do not completely agree with the above-quoted paragraph. Men were able to stand their regular four-hour watches where the temperature ranged from 83 to 86.25° F. without any notable degree of physical exhaustion or discomfort. However, it should be remembered that there is a constant movement of air in the engine room and the men were not working under still air conditions. In support of Professor Cadman's opinion, it may be said that the men worked with as little clothing on as possible. One is again impressed with the fact that the wet kata-thermometer gives a better index of the comfort conditions, checked also by personal observations, than does reference to dry bulb temperature and humidity determinations alone, for, by reference to Tables Nos. 11 and 12, it will be seen that the wet kata-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

thermometer cooling power only twice went below 5.5. This is only a little less than half the desirable cooling power in the tropics.

SUBMERGED PHASE

Torpedo room.—Conditions immediately became worse in the torpedo room after the dive, as shown by the comfort curve, until after the third hour, when it remained stationary. During the last 3 hours, however, comfort conditions became slightly worse than during the previous 10 hours. This was undoubtedly due to the increased vapor pressure, which gradually increased throughout the dive, since the temperature was affected so little. Our observations on the comfort of the men agree very closely with the changes in the vapor pressure. It will be noted that sweating of the bulkheads was present continually after the fourth hour. Starting the inboard ventilation after the third hour seemed to improve conditions at first, but as the vapor pressure increased, it was no longer efficacious. Considerable water was drawn from the ventilating ducts during the latter part of the experiment. Wind velocities were so low that they were of very little value.

Forward battery compartment.—Comfort conditions gradually became worse during the first three hours, then the trend of the curve was toward stabilization and after this the cooling power of the atmosphere was more or less constant. By reference to the remarks in Table No. 7 it will be noted that the changes in the methods of ventilation brought about the peaks and depressions in the comfort curve. Another very noticeable feature in the table descriptive of the forward battery compartment is the very marked increase of vapor pressure during the first and second hours, after which the vapor pressure remained almost constant. The air was practically at complete saturation. Again, referring to remarks in Table No. 7, it will be seen that the batteries were very warm, gassing freely and giving off a great deal of moisture. From the sixth hour, comfort conditions improved until the eighth hour, when there was a gradual regression in the comfort conditions noted.

Central operating compartment.—Immediately before the dive the compartment was extremely comfortable, the atmosphere having a cooling power of 12.80. Within one hour after the dive, the cooling power of the atmosphere had fallen to 8.05 and at the end of the second hour to 6.25. After this, with the exception of the fourth and fifth hours when inboard ventilation was started and had its effect, the comfort conditions were more or less unchanged until the tenth hour, when there was a decided drop, and from then on it remained steady. The vapor pressure at the end of the first hour was very little different from just before the dive, but at the end of the second

Digitized by Google Original from UNIVERSITY OF MICHIGAN

hour there was a marked increase in it, the vapor pressure going to 30.72. From then on there was a constant increase in moisture content of the air to the end of the dive.

The carbon dioxide and oxygen determinations and the barometric pressures are recorded on the table for the central operating compartment; the lowest oxygen percentage was 18.42 and the highest carbon dioxide percentage was 2.50, both of which were taken at the end of the dive. Barometric pressures ranged from 29.5 at the beginning of the run to 33.2 at the end. The temperatures of the outside water ranged from 82° to 83° F. and were taken at depths from 35 to 80 feet.

After-battery compartment.—Data recorded on the table for this compartment seem to demonstrate most forcibly that the movement of air as a result of running both engines, the temperature of the surrounding air affecting radiation, and moisture in the air, have the most effect on comfort conditions, for immediately before the dive when the air was circulating through the compartment freely and removing heat and moisture, the temperature of the air was 85.5° F., the cooling power of the air was 13.78, and the vapor pressure was 24.56, whereas within one hour after the engines ceased to run and the boat was submerged, the temperature was 94.5° F., the cooling power was 4.42, and the vapor pressure was 37.11. The battery temperature was practically the same immediately before the dive and during the first two hours after the dive. Furthermore, the galley range was in use before the dive and secured soon after submergence. It is most apparent that it was the volume of air passing through this compartment that carried off the heat and moisture and caused a free circulation of air. The use of the galley range in this compartment, as noted in the fourth and fifth hours, affects not only the cooling power but also the vapor pressure.

Engine room.—Comfort conditions became worse in the first two hours after the dive, due to the heat given off by the engines, and the improvement thereafter may be ascribed to the cooling of the engines, and also to the factors noted in the discussion of the motor room. The moisture content of the air as shown in mm. of mercury became high immediately after the dive, the air being practically at complete saturation throughout the remainder of the dive.

Motor room.—Although the motors were being operated constantly during the dive and the resultant heat thrown out into the compartment, it will be noticed that the comfort curve does not indicate this as would be expected under such circumstances. The wet kata cooling power of the air fell within the first hour of the dive from 5.98 to 2.38 and then at the end of the fourth hour to 1.71. At the end of the fifth hour it had risen to 4.14 and from

Digitized by Google Original from UNIVERSITY OF MICHIGAN

then on remained more or less constant. This very decided change in the comfort curve and its apparently acting against the normal physical laws, needs some explanation. It will be remembered in discussing most of the other compartments, we invited attention to the fact that the inboard ventilation, other than battery ventilation, was not operating until the third hour, and then only the forward blower was operating and that from the fourth hour both blowers were working. In other words, the changing of air from one part of the boat to another and the dissemination of the air, brought about this change. During the first four hours of the dive, the wet psychrometer readings were above 90° F. and during most of the remainder, above 88° F. The men on watch in this compartment arranged it among themselves to stand such watches for only 15 minutes. Upon being relieved from each watch they showed decided effects therefrom. Attention is invited to the wet bulb readings and the quotation on page 772. In so far as the moisture content of the air in this compartment is concerned, we desire to invite attention to the effect brought about by the change in the ventilation scheme. By reference to Table No. 12 it will be noted that after the fourth hour when all inboard ventilation was operating, the moisture content of the air had a decided drop and from thence on, remained practically the same.

93885—24——7

Digitized by Google Original from UNIVERSITY OF MICHIGAN

SECOND EXPERIMENT, U. S. S. "R-23," OCT. 9 AND 10, 1923

TABLE NO. 7.—*Torpedo room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	86. 0	79. 00	85. 00	24. 65	10. 20	2. 76	0. 317	Hatches closed; comfortable.[1]
Second hour	85. 8	81. 00	85. 00	26. 14	9. 70	3. 01	. 388	No change.
Third hour	85. 0	81. 00	84. 50	26. 21	9. 50	2. 90	. 276	More comfortable; men not sweating.
Fourth hour	85. 2	81. 00	85. 50	26. 13	9. 40	3. 01	. 331	Comfortable;[1] men not sweating.
Fifth hour	87. 0	79. 50	85. 50	24. 87	7. 60	2. 21	. 179	No change.
Sixth hour	86. 2	81. 00	85. 50	26. 13	7. 80	2. 08	. 098	Do.
Seventh hour	86. 0	81. 00	85. 50	26. 08	7. 60	2. 11	. 098	Do.
SUBMERGED RUN								
First hour	85. 6	81. 00	85. 50	26. 13	6. 60	2. 00	. 051	Comfortable.[1]
Second hour	86. 0	83. 00	86. 00	28. 86	6. 20	1. 99	. 064	Less comfortable.[1]
Third hour	86. 8	84. 00	87. 00	29. 99	5. 90	1. 90	. 079	Uncomfortable; Men sweating.
Fourth hour	86. 8	84. 00	86. 00	30. 48	5. 50	1. 85	. 446	Uncomfortable; inboard ventilation; sweating freely.
Fifth hour	88. 0	85. 00	86. 50	30. 87	5. 40	1. 70	. 083	Fairly comfortable; sweating fairly freely.
Sixth hour	87. 25	85. 00	86. 75	31. 99	5. 40	1. 70	. 049	Fairly comfortable;[1] some sweating.
Seventh hour	88. 0	85. 50	87. 25	32. 55	5. 70	1. 75	. 096	Slightly more comfortable;[1] bulkheads sweating.
Eighth hour	88. 5	85. 00	87. 00	32. 29	5. 50	1. 78	. 141	Less comfortable; men sweating.
Ninth hour	88. 0	85. 00	87. 00	32. 70	5. 50	1. 76	. 099	No change; sweating but not profusely.
Tenth hour	88. 0	85. 00	87. 00	33. 20	5. 40	1. 77	. 103	Bulkhead sweating profusely; men sweating.
Eleventh hour	88. 0	85. 00	87. 00	33. 40	5. 20	1. 87	. 133	Bulkhead same; men sweating very little.
Twelfth hour	88. 0	85. 00	87. 00	33. 51	5. 10	1. 77	. 103	No change.
Thirteenth hour	88. 5	85. 00	87. 00	33. 69	5. 10	0. 97	--------	Do.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE NO. 8.—*Forward battery compartment*

Time	Temperature (F °)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	86. 0	79. 50	86. 00	23. 12	7. 92	1. 93	0. 059	Hatches closed; comfortable.[1]
Second hour	87. 0	81. 50	86. 50	26. 70	8. 56	2. 07	. 131	Feels warm; men not sweating.
Third hour	87. 0	83. 00	87. 50	28. 06	7. 66	1. 99	. 109	Feels warm; slight sweating.
Fourth hour	87. 0	82. 50	87. 00	27. 49	8. 75	2. 69	. 385	Ventilation from conning tower to forward part of ship, then aft; comfortable.[1]
Fifth hour	87. 5	79. 50	87. 00	24. 85	9. 14	2. 14	. 194	
Sixth hour	88. 5	81. 75	88. 00	26. 84	8. 44	1. 75	. 128	Ventilation changed to aft; somewhat warmer.
Seventh hour	88. 0	81. 50	88. 00	26. 63	7. 50	1. 68	. 079	Not so comfortable; [1] slight sweating; battery temperature, 109°.
SUBMERGED RUN								
First hour	90. 0	81. 25	87. 50	26. 37	5. 66	1. 22	. 044	Uncomfortably warm; men sweating; battery odors noticeable; battery temperature, 118°.
Second hour	91. 0	88. 75	91. 50	34. 67	5. 02	1. 06	. 048	
Third hour	91. 3	89. 50	91. 50	35. 84	4. 37	1. 05	. 053	Very comfortable; sweating freely.
Fourth hour	90. 0	89. 50	91. 00	36. 61	4. 88	1. 15	--------	More comfortable; inboard ventilation; battery temperature, 104°.
Fifth hour	90. 0	88. 00	91. 00	34. 57	6. 36	1. 26	. 055	More comfortable;[1] slight sweating.
Sixth hour	90. 5	88. 00	90. 50	35. 25	5. 12	1. 24	. 076	Warm; sweating; battery ventilation changed to engine.
Seventh hour	90. 0	88. 00	90. 50	35. 56	5. 80	1. 39	. 095	More comfortable;[1] men sweating a little.
Eighth hour	90. 8	88. 00	90. 00	35. 59	6. 44	1. 44	. 181	About the same; possibly a little cooler.
Ninth hour	91. 0	87. 50	90. 00	35. 32	6. 01	1. 37	. 162	Bulkhead sweating profusely.
Tenth hour	90. 2	87. 50	90. 50	35. 97	6. 01	1. 49	. 150	Bulkheads same; men sweating very little.
Eleventh hour	91. 0	87. 50	90. 00	35. 97	5. 96	1. 25	. 106	No change.
Twelfth hour	90. 6	88. 00	90. 50	36. 93	5. 93	1. 23	. 073	Do.
Thirteenth hour	91. 0	88. 00	90. 50	36. 93	5. 63	1. 24	. 101	Do.

[1] Considering circumstances.

Barometric pressures taken concurrently with above figures: 29.5, 29.5, 29.5, 29.5, 29.4, 29.4, 29.35, 30.4, 30.6, 30.9, 31.1, 31.6, 31.75, 32, 32.2, 32.45, 32.7, 32.9, 33.05, 33.2.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 9.—*Central operating compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	87. 0	80. 50	87. 50	25. 82	11. 46	4. 55	1. 800	Conning-tower hatch open; condition very comfortable.[1]
Second hour	86. 0	80. 00	86. 00	25. 65	11. 60	3. 16	. 504	No change; kata changed from mid to side compartment.
Third hour	88. 5	80. 50	87. 00	25. 82	8. 83	1. 80	. 150	Less comfortable.[1]
Fourth hour	88. 0	81. 00	88. 00	26. 28	8. 86	1. 75	. 097	Ventilation changed; comfortable.[1]
Fifth hour	88. 0	78. 50	87. 00	24. 14	8. 80	2. 07	. 213	Comfortable;[1] no sweating.
Sixth hour	87. 5	79. 50	87. 50	24. 85	10. 42	2. 34	. 253	No change.
Seventh hour	85. 2	79. 00	86. 50	24. 56	12. 80	2. 96	. 311	Very comfortable; [1] no sweating.
SUBMERGED RUN								
First hour	88. 0	78. 50	86. 00	24. 10	8. 05	1. 99	. 177	Fairly comfortable; [1] cooking odors disagreeable.
Second hour	89. 5	85. 00	89. 00	30. 72	6. 29	1. 85	. 253	Fairly comfortable;[1] odors less disagreeable.
Third hour	89. 5	87. 00	90. 00	33. 09	6. 19	1. 11		Uncomfortable; all men sweating freely.
Fourth hour	88. 0	87. 00	90. 00	33. 41	7. 19	1. 55	. 048	Inboard ventilation; comfortable; [1] sweating freely.
Fifth hour	88. 0	85. 50	89. 50	32. 45	7. 40	1. 88	. 137	Comfortable; [1] slight sweating.
Sixth hour	91. 8	86. 00	89. 50	33. 08	6. 84	1. 12	. 122	Comfortable but warm; [1] more sweating.
Seventh hour	91. 5	87. 50	91. 00	33. 90	6. 45	1. 22	. 141	Comfortable;[1] better than previous hour.
Eighth hour	92. 0	88. 00	91. 00	35. 58	6. 37	1. 31	. 243	Hot; men sweating profusely.
Ninth hour	91. 8	87. 50	90. 50	35. 31	6. 20	1. 22	. 208	Condition generally good; men sweating freely.
Tenth hour	91. 0	87. 50	91. 50	35. 96	6. 67	1. 05	. 045	No change.
Eleventh hour	91. 0	88. 00	91. 50	36. 85	5. 67	1. 03	. 040	Condition good.[1]
Twelfth hour	91. 0	88. 00	92. 00	36. 94	5. 67	1. 09	. 057	No change.
Thirteenth hour	90. 5	88. 00	92. 00	37. 11	5. 72	1. 20	. 063	Do.

[1] Considering circumstances.

Eighth hour, O_2, 19.70 per cent; CO_2, 1.14 per cent.
Ninth hour, O_2, 19.38 per cent; CO_2, 1.60 per cent.
Tenth hour, O_2, 19.12 per cent; CO_2, 1.84 per cent.
Eleventh hour, O_2, 18.98 per cent; CO_2, 2.00 per cent.
Twelfth hour, O_2, 18.64 per cent; CO_2, 2.00 per cent.
Thirteenth hour, O_2, 18.42 per cent; CO_2, 2.50 per cent.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 10.—*After battery compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	87. 5	80. 00	86. 00	25. 44	8. 43	2. 37	0. 282	Conning-tower hatch open; other hatches closed.
Second hour	87. 0	80. 50	87. 00	25. 98	12. 15	4. 63	. 850	No sweating.
Third hour	88. 0	81. 50	88. 50	26. 76	11. 87	3. 08	. 856	Door to engine room closed.
Fourth hour	87. 0	81. 00	88. 50	26. 38	12. 19	2. 72	. 399	Changed ventilation.
Fifth hour	88. 5	80. 00	88. 00	25. 29	8. 75	1. 92	. 195	No change.
Sixth hour	88. 0	83. 00?	90. 00?	27. 95?	8. 75	1. 71	. 191	Do.
Seventh hour	85. 5	79. 00	86. 00	24. 56	13. 78	3. 61	. 681	Breakfast begun; comfortable.[1]
SUBMERGED RUN								
First hour	94. 5	91. 00	95. 50	37. 11	4. 42	. 51	-------	Range secured.
Second hour	96. 25	90. 50	94. 50	37. 11	3. 39	. 64	-------	Battery gas noticeable.
Third hour	94. 5	90. 50	94. 00	37. 86	3. 67	. 71	-------	Fairly comfortable;[1] no sweating.
Fourth hour	94. 5	91. 00	95. 00	38. 22	2. 95	. 52	-------	Range started; fairly comfortable.[1]
Fifth hour	97. 5	91. 50	96. 50	39. 22	2. 41	-------	-------	Range secured; fairly comfortable.[1]
Sixth hour	95. 5	88. 50	96. 00	38. 58	4. 79	-------	-------	Comfortable.
Seventh hour	94. 5	88. 25	95. 00	35. 71	4. 33	-------	-------	Range started.
Eighth hour	95. 5	89. 00	95. 50	36. 81	4. 16	-------	-------	Battery temperature, 103°.
Ninth hour	96. 5	89. 50	96. 50	37. 54	3. 95	-------	-------	Battery gas strong, causing tears.
Tenth hour	96. 5	88. 50	95. 00	35. 12	4. 45	-------	-------	Slightly uncomfortable; range secured.
Eleventh hour	95. 5	87. 00	95. 00	35. 27	5. 27	-------	-------	Warm but comfortable.[1]
Twelfth hour	95. 50	88. 00	94. 00	36. 88	4. 63	-------	-------	Comfortable.[1]
Thirteenth hour	95. 0	88. 00	93. 50	36. 89	5. 33	-------	-------	Do.[1]

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Digitized by Google

TABLE No. 11.—*Engine room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	92. 0	83. 00	90. 00	29. 96	6. 05	0. 380		Under way, both engines.
Second hour	93. 5	83. 50	93. 50	27. 61	7. 11	. 300		Stopped engines and began charge both engines.
Third hour	93. 0	86. 00	96. 00	30. 71	7. 11	. 190		Stopped port engine.
Fourth hour	93. 25	86. 00	98. 50	30. 87	5. 21			Water-tight door, after battery, to engine room closed, and air taken through motor room from superstructure ducts.
Fifth hour	93. 5	84. 00	96. 50	28. 71	5. 28			Return to original ventilation.
Sixth hour	93. 5	86. 25	99. 25	30. 96	6. 56			Starboard engine stopped; end of charge.
Seventh hour	92. 5	84. 50	97. 50	29. 32	4. 89			Galley range started; very warm; sweating.
SUBMERGED RUN								
First hour	99. 0	90. 00	99. 50	36. 11	3. 09			Range secured; very warm; sweating.
Second hour	99. 0	90. 00	99. 00	36. 38	2. 49			More comfortable.[1]
Third hour	96. 75	90. 50	98. 00	37. 39	2. 96			After part of boat not being ventilated; galley range started.
Fourth hour	96. 50	90. 00	97. 00	37. 12	2. 67			Ventilation in after part of boat begun.
Fifth hour	97. 0	90. 00	98. 50	37. 46	2. 87			Range secured; fairly comfortable.[1]
Sixth hour	97. 5	88. 50	99. 00	36. 22	4. 23			No change.
Seventh hour	96. 0	88. 00	98. 00	35. 66	3. 79			Do.
Eighth hour	96. 25	88. 50	97. 50	36. 49	3. 73			Do.
Ninth hour	98. 0	88. 50	97. 50	36. 80	3. 73			Battery gas and fuel oil noticeable.
Tenth hour	97. 25	88. 00	97. 00	36. 51	3. 89			No change.
Eleventh hour	97. 0	88. 00	97. 00	36. 71	3. 25			Slight sweating; slightly uncomfortable.[1]
Twelfth hour	96. 25	88. 00	96. 00	37. 06	3. 54			Same as last hour.
Thirteenth hour	96. 0	88. 00	95. 50	37. 25	3. 85			Less sweating; less uncomfortable.

[1] Considering circumstances.

Original from UNIVERSITY OF MICHIGAN

TABLE No. 12.—*Motor room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
First hour	93. 5	83. 00	92. 00	27. 93	8. 22	0. 386		Under way, both engines; comfortable.[1]
Second hour	98. 0	84. 75	94. 75	31. 78	6. 50	. 257		Stopped both engines; began charge; warm.
Third hour	99. 5	85. 50	97. 50	30. 26	6. 40	. 220		Warm but not depressing; port engine stopped.
Fourth hour	96. 75	84. 00	97. 00	28. 87	6. 97			Ventilation aft from conning tower.
Fifth hour	99. 0	85. 00	97. 00	29. 75	5. 82			Back to original ventilation.
Sixth hour	100. 0	85. 50	98. 00	29. 40	5. 21			Slight sweating; heat noticeable; charge ended.
Seventh hour	99. 5	86. 00	99. 50	30. 77	5. 98			Both engines on screws; galley range started.
SUBMERGED RUN								
First hour	102. 0	90. 50	102. 50	35. 64	2. 38			Crash dive; very warm.
Second hour	104. 0	91. 50	102. 00	38. 04	2. 05			Very warm; sweating.
Third hour	102. 0	91. 00	102. 00	37. 98	1. 81			Oppressive; sweating; ventilation forward.
Fourth hour	102. 0	91. 00	101. 50	37. 78	1. 71			No change.
Fifth hour	99. 0	89. 00	99. 00	36. 50	4. 14			Ventilation aft.
Sixth hour	98. 5	88. 50	98. 00	36. 12	4. 60			Fairly comfortable.[1]
Seventh hour	96. 25	88. 00	97. 00	35. 60	5. 21			Fairly comfortable;[1] galley range started.
Eighth hour	97. 25	88. 00	98. 00	35. 83	4. 94			No change; range secured.
Ninth hour	99. 25	88. 50	97. 50	36. 70	4. 50			No change.
Tenth hour	98. 0	88. 00	97. 00	36. 51	4. 74			Comfortable;[1] good movement of air.
Eleventh hour	98. 0	88. 00	97. 00	36. 66	4. 69			No change.
Twelfth hour	97. 0	88. 00	96. 00	36. 86	5. 23			Do.
Thirteenth hour	97. 5	87. 50	95. 50	36. 24	5. 06			Door to engine room closed momentarily; three men working for five minutes previous.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THIRD EXPERIMENTAL RUN

This run consisted almost entirely of surface cruising, with only two dives of one-half hour duration each, and was made by the U. S. S. *R-23* while on a war problem in connection with the search for the U. S. S. *Seattle*, which was approaching Balboa, Canal Zone, from San Francisco, Calif., on October 30, 1923. Data were collected every 3 hours for 42 hours, while the *R-23* was cruising in the Pacific. During this period the sea was comparatively calm, with the exception of a 24-hour period beginning after the third hour. By reference to the tables covering this experimental run it will be seen that comfort conditions in the living compartments were good, except in the torpedo room, where, however, the wet kata-thermometer cooling power never fell below 6.50. The low wet kara-thermometer readings in the torpedo room were, no doubt, caused by the number of men sleeping therein, usually from six to nine men. It will be remembered that 18 is a desirable wet kata-thermometer cooling power for living compartments on shore in the United States and England and from 11 to 16 at Coco Solo, Canal Zone, depending upon the locality in which the readings are taken and whether it is day or night. The higher readings at Coco Solo, Canal Zone, were recorded when the conditions were practically open and when there was a high wind blowing outside, which had a marked effect upon the elimination of heat. It will be seen that the figures obtained during the run do not approach the ideal. However, as experienced by us on this and previous experimental runs, they were not particularly bad, although it is felt that living conditions can and should be improved.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THIRD EXPERIMENT, U. S. S. "R-23," OCTOBER 29, 30, AND 31, 1923

TABLE No. 13.—*Torpedo room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	86. 0	79. 50	83. 50	25. 14	6. 50	2. 27	0. 141	All hatches closed but conning-tower hatch; comfortable;[1] slightly stuffy.
Third hour	87. 0	80. 00	84. 00	25. 43	7. 30	2. 55	. 318	Comfortable;[1] sea rough, swinging instruments unduly.
Sixth hour	85. 0	79. 50	83. 50	25. 14	7 59	2. 24	. 083	No change.
Ninth hour	88. 0	81. 00	84. 00	26. 33	7. 22	2. 48	. 423	No change; outboard ventilation.
Twelfth hour	86. 0	80. 00	85. 00	25. 52	7. 30	2. 42	. 181	Comfortable;[1] inboard ventilation; one-half hour dive during period.
Fifteenth hour	86. 0	83. 00	84. 50	28. 00	7. 30	2. 29	. 141	Comfortable;[1] engines stopped; water in fuel oil.
Eighteenth hour	85. 0	80. 50	85. 50	25. 99	7. 11	2. 48	. 141	Comfortable;[1] under way whole period.
Twenty-first hour	85. 0	80. 00	84. 00	25. 43	8. 28	3. 28	. 423	Rough; ventilation inboard; seven men sleeping in compartment.
Twenty-fourth hour	85. 0	79. 00	83. 00	24. 68	8. 37	3. 06	. 303	Rough; ventilation outboard; one-half hour dive during period; four men sleeping.
Twenth-seventh hour	83. 5	79. 00	83. 00	24. 68	8. 75	3. 28	. 276	Not so rough; eight men sleeping; ventilation outboard.
Thirtieth hour	86. 0	79. 00	85. 00	24. 66	7. 12	3. 67	. 810	Not so rough; nine men sleeping; ventilation same.
Thirty-third hour	86. 0	78. 00	83. 00	23. 80	9. 90	2. 87	. 360	Fairly calm; six men sleeping; ventilation same.
Thirty-sixth hour	85. 0	79. 00	84. 00	24. 67	10. 30	2. 78	. 226	Calm; ventilation same.
Thirty-ninth hour	86. 5	79. 00	84. 00	24. 67	9. 66	2. 97	. 456	Calm; all hatches open.
Forty-second hour	85. 0	81. 00	85. 00	26. 32	8. 92	3. 28	. 423	No change.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 14.—*Forward battery compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	86. 0	79. 00	85. 00	24. 66	9. 29	2. 97	0. 423	Comfortable;[1] took position in column of sections; speed 11 knots.
Third hour	87. 5	80. 00	84. 00	25. 43	11. 10	3. 53	1. 090	Sea rough, causing undue motion of instruments.
Sixth hour	87. 0	78. 00	84. 00	23. 79	11. 37	3. 67	1. 180	No change.
Ninth hour	86. 5	79. 50	85. 00	25. 13	10. 57	3. 53	. 810	Ventilation outboard.
Twelfth hour	86. 5	80. 00	85. 50	25. 45	8. 44	3. 40	. 723	Ventilation inboard; one-half hour dive during period.
Fifteenth hour	87. 0	82. 50	86. 50	27. 57	7. 99	2. 32	. 226	Ventilation outboard; engines stopped one-half hour.
Eighteenth hour	86. 0	80. 00	85. 00	25. 52	7. 85	3. 40	. 640	Ventilation inboard; running whole period.
Twenty-first hour	85. 0	79. 00	84. 00	24. 67	9. 69	3. 17	. 391	Ventilation outboard; three men sleeping.
Twenty-fourth hour	86. 5	78. 50	84. 00	24. 22	11. 10	3. 82	1. 040	Ventilation same; two men sleeping; one-half hour dive during period.
Twenty-seventh hour	86. 0	78. 00	84. 00	23. 19	11. 30	4. 59	1. 520	Ventilation same; three men sleeping.
Thirtieth hour	85. 0	78. 00	86. 00	23. 77	11. 28	7. 07	3. 350	Four men sleeping; no change.
Thirty-third hour	85. 0	77. 50	83. 50	23. 36	12. 38	4. 37	1. 090	Two men sleeping; no change.
Thirty-sixth hour	86. 0	78. 00	84. 00	23. 19	12. 85	4. 83	1. 680	Three men sleeping; no change.
Thirty-ninth hour	87. 0	80. 00	85. 00	25. 52	10. 29	3. 06	. 423	Calm; all hatches open.
Forty-second hour	86. 0	80. 00	86. 00	25. 35	10. 14	3. 40	. 640	Comfortable throughout entire run.[1]

[1] Considering circumstances.

Barometric pressures taken concurrently with above figures: 29.5, 29.5, 29.5, 29.5, 29.5, 29.5, 29.5, 29.5, 29.5, 29.5, 29.52, 29.5, 29.52, 29.53, 29.53.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 15.—*Central operating compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	88. 0	78. 00	85. 00	23. 98	9. 11	4. 94	2. 750	Three men on watch; blast of air through conning-tower hatch; good ventilation; barometer 29.5.
Third hour	87. 0	78. 00	83. 00	23. 80	9. 29	3. 53	. 951	Comfortable on account of cool night air; rough; barometer 29.5.
Sixth hour	85. 0	76. 00	83. 50	22. 21	9. 29	3. 17	. 391	No change; barometer 29.5.
Ninth hour	86. 0	77. 00	84. 50	23. 06	8. 93	2. 55	. 226	Ventilation outboard; three men on watch; barometer 29.5.
Twelfth hour	87. 0	78. 00	85. 50	23. 77	8. 75	2. 78	. 423	Ventilation inboard; one-half hour dive during period; barometer 29.5.
Fifteenth hour	86. 0	82. 00	84. 50	26. 62	10. 84	3. 04	. 640	Ventilation outboard; engines stopped one-half hour; barometer 29.5.
Eighteenth hour	85. 0	77. 00	77. 00	23. 08	12. 30	2. 87	. 250	Ventilation inboard; under way whole period; barometer 29.5.
Twenty-first hour	85. 0	76. 50	83. 00	22. 67	12. 90	2. 70	. 203	Ventilation outboard; barometer 29.5.
Twenty-fourth hour	86. 0	76. 00	83. 00	22. 22	11. 97	4. 83	1. 680	Changed course for Panama; very comfortable;[1] barometer 29.5.
Twenty-seventh hour	85. 5	77. 00	84. 00	23. 08	10. 76	5. 10	1. 580	Ventilation same; comfortable;[1] barometer 29.5.
Thirtieth hour	86. 5	77. 00	85. 50	23. 06	9. 85	3. 53	. 810	No change; barometer 29.52.
Thirty-third hour	87. 5	77. 00	84. 00	23. 08	10. 76	3. 17	. 810	No change; barometer 29.5.
Thirty-sixth hour	85. 5	77. 00	84. 00	23. 08	11. 75	3. 67	. 723	No change; one-half hour dive during period; barometer 29.52.
Thirty-ninth hour	88. 0	79. 00	87. 00	24. 64	11. 75	2. 87	. 681	Not as comfortable;[1] all hatches open; barometer 29.53.
Forty-second hour	87. 0	81. 00	88. 00	26. 28	9. 02	2. 19	. 170	Not as comfortable;[1] barometer 29.53.

[1] Considering circumstances.

Average temperature of outside water during run was 82° F.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 16.—*After battery compartment*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	87. 0	79. 50	86. 50	25. 17	11. 37	5. 40	2. 680	Good blast of air from conning-tower hatch to engine room.
Third hour	86. 0	80. 00	86. 00	25. 35	11. 10	3. 40	. 640	Comfortable.[1]
Sixth hour	83. 5	77. 00	88. 50	23. 02	12. 99	5. 10	1. 200	No change.
Ninth hour	84. 5	78. 00	84. 50	23. 78	11. 10	3. 82	. 640	Outboard ventilation.
Twelfth hour	87. 5	81. 00	88. 50	26. 27	10. 34	2. 33	. 276	Inboard ventilation; one-half hour dive during period; range in use.
Fifteenth hour	86. 0	80. 00	87. 00	25. 44	12. 99	3. 06	. 456	Outboard ventilation; engines stopped one-half hour.
Eighteenth hour	85. 0	78. 00	85. 00	23. 98	11. 65	3. 40	. 490	Inboard ventilation.
Twenty-first hour	85. 0	77. 00	84. 00	23. 08	10. 79	4. 83	1. 370	Outboard ventilation.
Twenty-fourth hour	85. 0	76. 00	83. 00	22. 22	11. 96	5. 78	2. 090	Good blast of air from conning-tower hatch.
Twenty-seventh hour	85. 0	77. 00	84. 00	23. 08	11. 10	5. 10	1. 580	No change.
Thirtieth hour	85. 0	77. 00	85. 00	23. 06	11. 75	6. 12	2. 410	Do.
Thirty-third hour	86. 0	77. 00	84. 00	23. 08	11. 29	3. 82	1. 000	Galley range in use.
Thirty-sixth hour	87. 0	80. 00	86. 00	25. 35	11. 56	4. 37	1. 630	Breakfast.
Thirty-ninth hour	89. 5	81. 00	88. 00	26. 28	7. 74	1. 50	. 106	All hatches open.
Forty-second hour	90. 0	84. 00	91. 00	28. 86	7. 04	----------	----------	No change.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 17.—*Engine room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	89. 5	82. 50	93. 00	27. 50	7. 99	0. 990		Fairly comfortable for this compartment.[1]
Third hour	89. 0	82. 00	90. 00	26. 24	7. 30			Much motion.
Sixth hour	88. 0	80. 00	89. 50	25. 50	6. 76	. 629		Not as rough.
Ninth hour	89. 0	81. 50	90. 00	26. 54	7. 99			No change.
Twelfth hour	93. 0	83. 50	94. 50	28. 51	7. 47			Getting rough again; one-half hour dive during period.
Fifteenth hour	92. 5	83. 00	92. 00	28. 01	7. 99			Fuel-oil fog; outboard ventilation.
Eighteenth hour	89. 0	81. 00	90. 00	26. 26	7. 84			No change.
Twenty-first hour	89. 0	80. 00	88. 00	25. 51	7. 72			Do.
Twenty-fourth hour	89. 0	81. 00	88. 00	26. 28	7. 11			One-half hour dive.
Twenty-seventh hour	89. 0	81. 00	88. 00	26. 28	8. 13			Slight fuel-oil fog.
Thirtieth hour	89. 0	81. 00	88. 50	26. 27	7. 67			No change.
Thirty-third hour	89. 0	81. 00	89. 00	26. 27	7. 99			Uncomfortable except in line of air.
Thirty-sixth hour	91. 0	82. 00	91. 00	27. 21	7. 73			Same.
Thirty-ninth hour	91. 0	81. 00	92. 00	26. 35	9. 99			Same; engine-room hatch open.
Forty-second hour	93. 0	85. 00	95. 00	29. 85	4. 73			Very uncomfortable; engines stopped one-half hour ago; no draft of air.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 18.—*Motor room*

Time	Temperature (F.°)	Psychrometer (F.°)		Vapor pressure (mm. of mercury)	Kata cooling power		Wind velocity (M. per second)	Remarks
		Wet	Dry		Wet	Dry		
SURFACE RUN								
Start	99. 5	89. 00	97. 00	33. 90	7. 00			Warm; could get no dry readings in 15 minutes.
Third hour	97. 0	85. 00	94. 00	29. 86	7. 00			Warm but more comfortable.[1]
Sixth hour	96. 5	84. 00	95. 50	28. 98	7. 34			Comfort conditions same;[1] weather calmer.
Ninth hour	98. 0	84. 00	96. 00	28. 97	6. 38			Much motion.
Twelfth hour	99. 5	86. 50	98. 50	29. 24	6. 07			Uncomfortable; one-half hour dive; inboard ventilation.
Fifteenth hour	96. 0	85. 50	96. 00	30. 37	5. 55			Outboard ventilation; uncomfortable.
Eighteenth hour	97. 0	85. 00	95. 00	29. 85	6. 07			Inboard ventilation; uncomfortable.
Twenty-first hour	98. 0	89. 00	94. 00	33. 93	5. 92			No change.
Twenty-fourth hour	98. 0	86. 00	97. 00	30. 88	4. 14			Hot and uncomfortable; return trip, 11½ knots; float 200A.
Twenty-seventh hour	98. 0	85. 00	97. 00	29. 83	6. 61			No change; float 100A.
Thirtieth hour	97. 0	86. 00	96. 00	30. 90	7. 22			No change.
Thirty-third hour	97. 0	85. 00	96. 00	29. 84	7. 12			Do.
Thirty-sixth hour	96. 5	84. 00	96. 00	28. 97	7. 47			Do.
Thirty-ninth hour	96. 0	84. 00	98. 00	28. 75	6. 73			All hatches open.
Forty-second hour	95. 0	91. 00	97. 00	36. 30	7. 24			Motors and engine not running; no heat.

[1] Considering circumstances.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

REVIEW OF THE COMFORT CONDITIONS IN THE BOAT AS A WHOLE

This discussion is not only based on experiments described heretofore but also upon our personal observation on other trips made on submarines in this locality. We have also conferred with officers attached to boats based here and have carefully studied the various ventilating systems of this type of submarines to aid us in drawing logical deductions from the data obtained. We believe, from our personal observations and from the data obtained, that the "R" type of submarine is capable of performing war patrols in this locality, and, in all probability, in any tropical waters without physical injury to the personnel. However, as has been shown, comfort conditions are far from being ideal, and it is our conviction that they can be improved markedly. Aside from the ventilation which, as has been shown, depends upon physical factors rather than upon chemical ones, there are other conditions affecting the comfort of the men aboard this type of submarine, which we believe worth while bringing to the attention of the Navy Department. The complex odor which may be described as typical of submarines, being composed of body odors, fuel-oil smells, emanations from batteries, from the galley, from lubricating oil, etc., is bound to have a psychic effect on the personnel and lower their morale. Improvements in the ventilation, both submerged and on the surface, will, unquestionably, tend to render such an odor less noticeable. Two other conditions which affect comfort markedly are the inadequate and inaccessible toilet facilities and the complete lack of bathing arrangements other than buckets on the topside. It was noticed that men rather than visit the toilet, would urinate and defecate over the side of the ship. By talking to the men we learned that this inconvenience caused them to refrain from carrying out normal functions as frequently as nature dictated, and it is our belief, derived from regular physical examinations of the men, that this condition brings about chronic constipation among submarine crews. Another factor which affects comfort in this type of submarine is the inadequate storage facilities for provisions, particularly fresh provisions, where there is no ice box available. Moreover, the messing arrangements are not conducive to contentment of the crew. Still another factor which we observed that must have its detrimental effects on comfort is the totally inadequate berthing facilities for the crew.

Comfort conditions were not as good in the torpedo room as in the forward battery, central operating, and after battery compartments when on the surface, nor in general was it quite as good when submerged as the forward battery and central operating compartment after the engines had cooled down. The difference in the wet kata-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

thermometer cooling power among these compartments was not marked.

Since the torpedo room is most remote from the engine room where most of the heat is generated this seemed rather strange to us when the boat was on the surface; however, after considering all factors concerned, it now appears that this should have been expected. On surface runs the supply of air for the torpedo room is taken in by a blower located therein. The outboard intake for this supply of air is located in the after part of the periscope shears and is housed in and has not free access to the outside air. In this same superstructure compartment the battery ventilation is discharged, and inasmuch as batteries are practically always being charged when the boat is on the surface, and the air from these batteries will range from 95° to 118° F., much of the same air is carried back into the torpedo room and tends to raise the temperature and humidity and to add battery odors to this compartment. Another factor which would tend to make the forward part of the torpedo room uncomfortable is that none of the supply ducts lead far enough forward, particularly on the port side where observations were taken.

Under submerged conditions by the nature of the ventilation, which is too well understood by the readers to require explanation, if the air is circulated from the motor room through the air ventilating duct leading under the superstructure to the torpedo room, which actually occurred during our experiment, there is not sufficient heat taken out of the air in its passage to prevent the torpedo room from getting some of the effect of the heated air from the motor room. As explained, there is not sufficient air motion in the forward part of the torpedo room to prevent pocketing. Another factor which must be taken into consideration is that in the battery compartments the battery blowers aid in producing movement of the air, while in the central operating compartment and battery compartments there are blowers and louvers which are installed for the purpose of causing air to circulate in these compartments. Should the main ventilation system be reversed, which was not done during the experiment, it would seem that the accumulation of heat and moisture from other compartments would pass on to the torpedo room and then would pass on to the motor room and therefore would not relieve conditions very much. Still another factor which must be considered is that during the experiment quite a number of men were sleeping in the torpedo room. The proper placing of a type of overhead fan with a large dispersing effect would no doubt increase the movement of the air and improve comfort conditions in this compartment.

On the surface, during all three runs, comfort conditions were slightly better in the forward battery compartment than in the tor-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

pedo room. This may be attributed to the fact that there is a current of air traveling aft from the torpedo room and that the distribution of blowers and louvers in the forward battery compartment produced a fair movement of air. In addition, the current of air down the conning tower hatch toward the engines produces a suction upon the air in the forward battery compartment. Under submerged conditions the most notable factors are the rise in air temperature and increase in the moisture content of the air immediately after submergence. It is noted that these figures remain high throughout the submerged run. This condition is undoubtedly due to increase in the temperature of the batteries and the large amount of moisture given off therefrom. In this connection it is evident that a properly placed overhead fan would aid in producing a more even circulation of air in the compartment and thus tend to produce an improvement in comfort conditions.

Furthermore, a combined cooling and drying system, a type of which was discovered by the writers in New York and which is now being investigated by the Bureau of Construction and Repair at our instigation, would be of tremendous assistance in improving living conditions in this compartment as well as in other compartments, inasmuch as water would be taken from the saturated air before distribution throughout the boat. Moreover, in the forward and after battery compartments the circulation of air is so much better that these would seem to be the logical places in which to locate such apparatus. The soda-lime purification plants are located in these compartments, apparently for the reason mentioned above. It may be possible that such a cooling and drying apparatus would, by the nature of its contents and construction, remove body, cooking, and battery odors.

Little need be said regarding the ventilation of the central operating compartment on the surface, owing to the free circulation produced by the current of air down the conning-tower hatch and aft to the engine room. Furthermore, the blower located in this compartment, with its well-distributed louvers, assures a fair movement of air. The air thus supplied contains battery gases due to the relative arrangement of the main induction intake and the outlet of the battery ventilation duct, as noted in the discussion of comfort conditions in the torpedo room. The location of this blower and its louvers has its beneficial effects also during submergence.

There were noted no detrimental effects upon the five to ten men who performed light work in the central operating compartment, nor did any of the men, with whom we talked freely, complain of any such effects. Of course, the conditions were far from what we

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ordinarily think of as comfortable, but considering the circumstances, they were not at all bad.

In previous dives made by us during engineering runs on "O" boats, in talking to the officers and men previous to the dive, we gained the impression that a five-hour dive was a great hardship in these waters. All during the dive the writers, who were in two different O-boats, noted that the men constantly watched the clocks and made statements to the effect that they were undergoing considerable hardship. However, neither of us in these dives, on the O-boats, felt much greater discomfort than we did in the R-boats from which we recorded most of our data. Before going down with the R-boats we gained a similar impression from the crew of the *R–23*. Members of the crew stated that during a 10-hour dive most of the men would be played out. However, during this dive we heard practically no complaint from them and we noted with particular interest that there was no loss of appetite when meals were served, which is a very significant fact. When it came time to take the dive throughout daylight hours, the men of the *R–23* entered upon their work with great enthusiasm and with no expressions indicating that they anticipated any great hardship. In fact, in talking with these men during and since these experiments, all expressed the opinion that they saw no reason why the regular war patrol with R–boats could not be performed in and about this area, provided they had rest periods, which, of course, are always given.

Needless to say, there was considerable sweating among the personnel, but inasmuch as the air was practically saturated and the temperature high, this must necessarily be the case and, as stated in the discussion of the ten-hour dive, the men lost approximately five pounds each in weight. We have no doubt that this weight would largely be regained in the time the boat is ordinarily on the surface. In so far as the chemical effect of the air upon the men is concerned, we wish to reiterate that, in our opinion, the effects of the increase of carbon dioxide and decrease of oxygen, the actual percentages of which were determined in this compartment, have no noticeable effects upon the men under war patrol conditions, i. e. unless submerged for over seventeen hours. On the other hand, we are convinced that all the discomforts noted were due to the increase of temperature, and moisture content of the air and the insufficient movement of air. In support of this view it is noted that in this compartment there were two wall fans in use. It was observed that the clothing of the men who sat directly in front of these fans remained comparatively dry, showing that the envelope of moisture was being removed from around their bodies, allowing evaporation to take place, and thus keeping these men more comfortable. It would seem then, that, as has been recommended for the torpedo room and for-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

ward battery compartment, the proper placement of an overhead fan would have a good effect upon comfort conditions in this compartment. The installation of a cooling and drying apparatus, as has been recommended, would also have a beneficial effect.

By reference to the tables covering the after battery compartment during surface conditions, it would seem that very little is needed in a remedial way to increase comfort here. As mentioned previously, the suction of the engines produces a considerable draught of air from the conning tower hatch through the after battery compartment. Even the use of the galley range has little effect upon general comfort conditions on the surface when the engines are running. While submerged, this compartment receives air of increased temperature and moisture content from the three first compartments of the ship, as well as air derived from battery ventilation, also high in moisture content, of high temperature, and laden with battery odors. The use of the galley range under submerged conditions has a marked effect upon comfort here, adding as it does not only heat and cooking odors but considerable moisture to the air. Another factor which must be considered is the proximity of the after battery compartment to the engine room from which it receives considerable heat, particularly during the first part of a dive when the engines are cooling off and liberating large quantities of heat. Despite the fact that the arrangement of the ventilating apparatus in the after battery compartment is similar to that in the forward battery compartment, and in many ways the two compartments are comparable, nevertheless, owing to the proximity of the engine room and the location of the range in the after battery compartment, greater remedial measures for submerged runs must be instituted here than in the forward battery compartment. Bearing this in mind, the measures suggested for the improvement of comfort conditions in the forward battery compartment would seem to hold good in the after battery compartment also.

As brought to the attention in previous statements, comfort conditions in the engine room on the surface were not as bad as we had expected, nor indeed as bad as is seen in surface craft of the Navy. The ventilating systems of this compartment in which men have to work during watches of only four hours, is adequate in our opinion. After the first three hours of submergence our charts seem to show that the engines have cooled down sufficiently to bring about a fairly stable effect upon the cooling power of the katathermometer. Although it is well below half what it should be ashore under similar conditions, it is not sufficiently bad to warrant improvement when it is considered that men are not required to do but occasional work in the engine room during submergence. Any

Digitized by Google Original from UNIVERSITY OF MICHIGAN

such apparatus as would be required to improve conditions markedly would be prohibitive on account of its weight and the space occupied.

In the motor room there is located one of the main ventilating blowers with a capacity of 2,500 cubic feet per minute, which may be used on the surface as well as when submerged. This blower is so arranged that it may be used as exhaust or supply. Inasmuch as it is connected with the same ventilating system as the forward blower, located in the torpedo room, and therefore has a common intake and outlet to the surface, it should not be used as an exhaust blower on the surface when the forward blower is used on supply. However, if it were possible to exhaust the air into the main outlet for the battery exhaust, it seems to us that such an arrangement would be of tremendous assistance in the motor and engine room compartments when running on the surface. Comfort conditions in the motor room are bad, but we are unable to recommend at present any change which will efficiently improve the conditions existing there.

Under submerged conditions, it is felt that the blower in the motor room should only be run as an exhaust blower. For, by this arrangement, the warm air in the compartment is passed forward under the superstructure and opportunity is afforded for the temperature and moisture content of the air to be lowered, as mentioned in the discussion of the torpedo room.

CONCLUSIONS

1. The discomfort experienced by personnel in submarines on the surface and submerged during a regular war patrol in the Tropics is due to physical changes in the air and not to chemical changes. Carbon dioxide and oxygen need not be taken into consideration when submerged for not longer than seventeen hours.

2. On R-boats it is possible to perform in the Tropics a regular war-time patrol for a period of two weeks with a rest period of equal time without any detrimental physical effects on the personnel. However, conditions are far from being what we would ordinarily consider comfortable and it is believed that such remedial measures for the improvement of comfort conditions, as would not affect the military efficiency of the boat, should be installed.

3. (*a*) It seems to us that comfort conditions on the surface would probably be made more satisfactory if the main intake for the ventilating system was raised sufficiently high to allow free access to the outside air. In rough weather it might be necessary to have a ventilator cowl, adjustable for height, installed.

(*b*) The main ventilating supply blower in the torpedo room should be increased in capacity from 1,600 cubic feet to 3,000 cubic feet per minute. If this is done, the duct leading forward from the main intake will have to be enlarged.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

(*c*) If possible, it should be so arranged that the blower in the motor room could be run on exhaust while on the surface and the exhaust air carried out of the boat through the outlet now provided for the battery exhaust.

(*d*) Properly designed overhead fans should be provided for each compartment with a view to producing a more thorough circulation of air throughout the entire compartment.

(*e*) Under submerged conditions the ventilating system with the improvements mentioned under surface cruising and those to be mentioned later would be satisfactory.

(*f*) The air under submerged conditions soon becomes saturated with moisture and the difference in temperature between the outside water and the inside air is not sufficient to cause the heat to be carried off fast enough. Therefore, in order to improve comfort conditions when submerged, it would seem advisable, if the military efficiency of the boat would not be hampered, to install a cooling and drying system in the forward and after battery compartments.

4. The improvement of the ventilation of submarines would no doubt do away with some of the disagreeable odors noted in them.

5. Many of the so-called hardships complained of by submarine crews are largely psychic.

6. In new constructions: (*a*) The ventilating systems for the living compartments should be separate from that of the engine and motor rooms.

(*b*) All ventilating piping should be as straight as possible to reduce resistance.

(*c*) Better toilet and bathing facilities should be provided.

(*d*) Sufficient berthing space should be provided for the complement assigned.

STUDIES BY THE UNITED STATES PUBLIC HEALTH SERVICE REGARDING CHEMICAL AND PHYSIOLOGICAL ASPECTS OF INDUSTRIAL FATIGUE

Changes in the organism resulting from exposure to high environmental temperatures, low humidities, and moderate air movements

The following summary of studies made last year with a view to determining the changes that take place in the blood as a result of exposure to high environmental temperatures, is taken from the annual report of the Surgeon General of the United States Public Health Service:

"With an air movement of approximately 50 feet per minute and a humidity of 33 per cent, a summary of the major results obtained is presented below.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"During an exposure of six hours to an environmental temperature of 68° F. or 86° F. there was a drop in body temperature, probably due to a decrease in muscular activity. At 104° F. there was an increase of 1.8° F. in body temperature without an initial drop. At 113° F. and at 122° F. the body temperature rose within an hour to such a height that it was deemed unsafe to continue the experiments.

"The oxygen capacity of the blood showed no changes during exposure to the different temperatures that can not be accounted for by the diurnal changes in the hemoglobin or by the concentration of the blood due to excessive evaporation of water.

"The oxygen content of the blood remained unchanged at 68° F., but showed a drop at 86° F., which fact is probably associated with the low rate of metabolism at this temperature. At 113° F. and 122° F. there is a slight increase in the oxygen content, due to the increased aeration of the blood at these temperatures, but this increased aeration is not in direct proportion to the increased passage of air over the membranes of the mouth and throat.

"At the temperature of 68° F. and 86° F. the alkali reserve, as shown by the carbon dioxide capacity, remains unchanged; while at 104° F. there is a sharp fall during the first two hours, followed by a slower fall during the next two hours. At temperatures of 113° F. and 122° F. there is a rapid depletion of the alkali reserve, which is almost identical for each of these two temperatures.

"The carbon dioxide content follows the alkali reserve, except that at 86° F. there is a slight rise, for the same reason that the oxygen content falls.

"The hydrogen-ion concentration of the plasma remains unchanged during an exposure of the animal to a temperature of 68° F., 86° F., and 104° F., but decreases at temperatures of 113° F., and 122° F., because of the excessive pulmonary ventilation at these temperatures with the consequent washing out of carbon dioxide without a compensatory loss of akali from the blood.

"The concentration of blood sugar falls during an exposure to temperatures of 68° F. and 86° F. This fall is probably associated with the inactivity of the animal during the course of the experiment. At 104° F. it falls during the first two hours, to increase during the following four hours. At 113° F. no change was noted during an hour's exposure, while at 122° F. there was a sharp rise during this time.

"The blood solids at 68° F. and 86° F. showed only the usual diurnal changes, while at 104° F., 113° F., and 122° F. the concentration of the blood increased with the environmental temperature, no initial drop being seen.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"There was no increase in lactic acid shown during the exposure.

"When the air movement during an exposure to an environmental temperature of 122° F. was increased to 224 feet per minute, it was found that there were not only minor changes in the blood gases and carbon dioxide capacity, but an increase in the blood solids at the end of an hour, as compared with the changes that take place during the same length of exposure with an air movement of 50 feet per minute. At the end of a four-hour exposure with the increased air movement, the blood gases and carbon dioxide capacity had dropped to the same low level as had been observed at the end of an hour with an air movement of 50 feet per minute. The body temperature had risen more than 5° F., and it was deemed unsafe to continue the exposure. The blood solids indicate a condition of anhydremia which, in the cases of the smaller animals, results fatally.

"When the animals were permitted to drink all the water they wanted during the four-hour exposure to a temperature of 122° F. and an air movement of 224 feet per minute, no changes could be noticed in the blood gases and carbon dioxide capacity. There was a drop in the hemoglobin content and a fall in the blood solids, due to a dilution of the blood. The body temperature remained unchanged during the exposure."

EPIDEMIOLOGICAL REPORT OF AN OUTBREAK OF BACILLARY DYSENTERY AT THE MARINE BARRACKS RIFLE RANGE, SANTO DOMINGO CITY, DOMINICAN REPUBLIC

By H. B. La Favre, Lieutenant, Medical Corps, United States Navy

A small epidemic of bacillary dysentery which occurred in December and January at the marine barracks at the rifle range 10 kilometers from the city of Santo Domingo, Dominican Republic, was attended by certain unusual features that are of interest from the epidemiological standpoint.

Dysentery was not prevalent at the rifle range until a small detachment from the Fourth Regiment of Marines located at Santiago, Dominican Republic, came to this post for instruction at the machine-gun school. The disease had been endemic in Santiago for some months past, so, when the first case developed here, I naturally supposed that the infection had been imported by these new men. Subsequent developments, however, showed that this supposition was probably wrong. Anyhow, four days after their arrival, the first case of the disease appeared. Three days later two more patients reported for treatment, and on the following day still another. This immediately attracted attention to the danger of an outbreak, so steps were taken for its control before it should become wide-

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

spread. These first cases were removed from camp by transfer to the base hospital.

While it was thought, as stated before, that the origin of the infection was obvious, still it was considered expedient to apply all precautionary measures in order that any other source from which the disease might possibly be coming should be blocked. Suspicion attached itself first to raw fruits and vegetables which the mess sergeant had been purchasing from the natives for use in salads and desserts. The serving of all uncooked foods was stopped at once and the men were warned against consuming such articles outside the camp. At this time also, a lecture was given them about the dangers of drinking unboiled water while on liberty.

The next step was a careful survey of our own water supply. Thus far, we had considered this to be above reproach. The water was pumped from two deep, properly protected wells, each a half mile distant from camp, into a large storage tank, where it passed to an excellent boiling plant and was boiled for 30 minutes prior to its distribution to the scuttle butts. The pronounced feature of this plan was, that from the well to its final disposition in the scuttle butts the water was not once handled by anyone, but was all conveyed by an uninterrupted system of pumps, pipes, and tanks. No contamination of the drinking water, it seemed, was therefore possible. Still suspicious, however, that the water supply might be at fault, I made a minute examination of the piping and, to my surprise, found that in the original design of the system a pipe had been led directly from the storage tank into the galley. This water, which, until then I had believed was coming from the boiling plant, was being served on the tables as drinking water by the mess sergeant, who labored under the same false impression as myself. This supply was cut off at once, and boiled water was substituted. An analysis of the water was then deemed advisable. Both wells showed fecal contamination. In view of this finding and because the boiling plant was not of sufficient capacity to accommodate all the water used for purposes other than drinking and cooking, chlorination in the main distributing tank was begun. The results which followed proved conclusively, I believe, that the water was the source of our epidemic.

The latrine was next given attention. Here, scrubbing of the seats once daily with lye and cresol was increased to twice a day. Likewise, daily burning with kerosene replaced the triweekly process of liming. In addition a bucket of bichloride solution was placed in the latrine under the supervision of a hospital corpsman, and each entrant was compelled to wash his hands in it before leaving.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The galley, which has never been ideal, was kept as sanitary as possible. It had been screened before, but now greater care than ever was taken to prevent the admission of flies. A careful check was kept to see that all dishes were being properly scalded, and a hospital corpsman was assigned to oversee the sterilization of individual mess gear in a 5 per cent solution of cresol after each meal. Another bucket of bichloride (properly labeled and protected) was put in the galley and all the galley force were instructed to rinse their hands in it frequently before and during the handling of food. Each day the medical officer made a personal inspection of the galley force for the presence of dysentery.

As adjuncts to the measures already described, the following steps were taken:

(*a*) Especial efforts were made to keep the entire camp sanitary at all times.

(*b*) All men attached to the garrison were given lectures by the medical officer concerning the dangers of the disease, its infectivity, and its mode of transmission. They were told of the personal hygienic measures which they should follow to prevent contracting it, and their full cooperation in fighting the disease was solicited. It is a noteworthy fact that, in face of the many restrictions and inconveniences entailed, not one comment of dissatisfaction or criticism was heard. The men's attitude in accepting the situation was commendable.

(*c*) The company commanders were ordered to muster their men each morning, search out new cases and send them to the sick bay for treatment.

(*d*) The bed clothing of all men in camp was aired and sunned daily for three hours.

(*e*) A guard was placed over each well.

There were, in the whole epidemic, 67 cases of the disease, involving about 20 per cent of the command. The total number of sick days was 423. Only 10 cases were sent to the base hospital at Santo Domingo City. The remainder were cared for in camp. Those sent to the hospital were typed and found to be suffering from bacillary dysentery of the Flexner strain. Those retained in camp were exactly similar in nature except not quite so severe. The epidemic lasted from December 17, 1923, to January 11, 1924, inclusive, a period of 26 days. The peak was reached on January 4, 1924, with the admission of 14 new cases on that day. Subsequently the incidence rapidly subsided until January 12, 8 days later, and thereafter no new cases developed.

The bureau's attention is invited to the fact that this epidemic was successfully controlled within a comparatively short time.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

On the 2d of January, after the report of water analysis had been received, the original source of the infection was removed by chlorination of the water supply. The disease was thereafter necessarily spread by direct or indirect contact. The most dangerous conveyors of the disease are the hands. Sterilization of the hands after each defecation solved this problem. The second most dangerous source of contact was the water in which mess gear was washed. The method of dipping the gear first into soapy water and afterwards into a rinsing basin, even though this water be boiling at the time, is uncertain and leaves too much to the individual. The assiduousness with which a man may cleanse his gear, the length of time during which it is immersed, the quantity of grease and other foreign matter on the gear are variable and uncertain factors. Sterilization of the gear prior to washing seemed to be the method of correction for this possible source of spread. Within eight days after these measures were put into force the outbreak, which had already gained considerable momentum, was ended.

During the outbreak cases developed as follows:

Date	Cases	Date	Cases
Dec. 17, 1923	1	Dec. 31, 1923	5
Dec. 18, 1923	0	Jan. 1, 1924	0
Dec. 19, 1923	0	Jan. 2, 1924	2
Dec. 20, 1923	2	Jan. 3, 1924	1
Dec. 21, 1923	1	Jan. 4, 1924	14
Dec. 22, 1923	1	Jan. 5, 1924	8
Dec. 23, 1923	1	Jan. 6, 1924	5
Dec. 24, 1923	0	Jan. 7, 1924	6
Dec. 25, 1923	1	Jan. 8, 1924	5
Dec. 26, 1923	2	Jan. 9, 1924	3
Dec. 27, 1923	1	Jan. 10, 1924	3
Dec. 28, 1923	1	Jan. 11, 1924	3
Dec. 29, 1923	1	Jan. 12, 1924	0
Dec. 30, 1923	0		

BACILLARY DYSENTERY AMONG MARINE CORPS AND NAVY PERSONNEL SERVING WITH THE GENDARMERIE OF HAITI

Six cases of bacillary dysentery occurred during the year 1923 among 108 officers and enlisted men of the Navy and Marine Corps, serving in the constabulary detachment. Although this disease is preventable under proper control, the duties of the members of this detachment carry them into the hills where they frequently encounter insanitary conditions and drink unboiled water. Orders are in effect that all drinking water must be boiled, but constant enforcement of this order is difficult and the individual members of the detachment must be trusted to protect themselves. It is believed that all officers

Digitized by Google Original from UNIVERSITY OF MICHIGAN

and men realize the importance of existing sanitary orders and make an honest effort to comply with them, but conditions frequently arise which make this difficult or impossible.

BACILLARY DYSENTERY IN GUAM

The monthly sanitary report for January, 1924, states that 69 new cases of bacillary dysentery among natives were treated during the month. Eight deaths occurred in the hospital from this disease, and there were 24 deaths in native homes from untreated cases.

Four cases and no deaths occurred among Navy and Marine Corps personnel. Three of the four patients were native enlisted men.

NEEDLESS NOISE A DETRIMENT TO HEALTH AND EFFICIENCY

The following paragraphs were abstracted from the Weekly Bulletin published by the Chicago Department of Health for the week ended March 8, 1924. It is clear enough that this subject is not without hygienic importance, and also that some or many of the harassing and fatiguing noises which naval personnel endure on board ship are, at least in part, unnecessary.

"Noises of a disturbing and nerve-racking character seem to be an inseparable part of life in a big city. However, it must be admitted that a large percentage of city noises are unnecessary, and therefore preventable.

"Noise is always a tax and strain upon people's nerves; and because this is true, it is from a health standpoint of prime importance that all unnecessary and avoidable noises be eliminated.

"The commissioner of health recognizes the importance of suppressing needless noises in Chicago. The present issue of the Bulletin is devoted to a discussion of this subject. All good citizens are invited to lend their best aid in the campaign now starting for making Chicago a more quiet and restful city in which to live.

"Noise may be defined as a sound of an inharmonious, confused or disagreeable nature. Some of its synonyms are clamor, din, blare, hubbub, racket, roar, rumble, and rattle.

"Where human beings congregate there is noise, and in general the amount of noise is in proportion to the size and activity of the community. Chicago is a noisy city; not more so perhaps than any other city of its size, but nevertheless noisy.

"The Turbulent ebb and flow of city life and its many and varied activities all combine to create noise and confusion. While it must be admitted that a certain amount of noise is necessary and un-

Digitized by Google Original from UNIVERSITY OF MICHIGAN

avoidable, there is much in a city like Chicago that can be avoided or suppressed.

"In fact, there is almost as much wear and tear in its effect upon one's energy and physical and mental strength as the exertion one puts forth in the performance of one's daily tasks. The deleterious effect of noise upon the public health is something that must be taken seriously into account under present-day conditions.

"When we consider specialists who are in a position to know, assert that city noise is one of the leading causes of nervous disorders and that the elimination of noise would prolong the average life of the city dweller about seven years, at the same time materially increasing individual and community efficiency, we may realize that control of noise is a matter of serious import to the citizens of Chicago, and one which demands the whole-hearted support of the community.

"Workers in general are protected to-day against most forms of inconvenience and annoyance, but not against noise, and it is now recognized that a great deal of inefficiency in offices and factories is due to the fatiguing effects of noise. It is a fact that most of us get used to noises of any kind sooner or later, and, therefore, nervous strain is not always felt as the result. On the other hand, we are often unaware of what makes us tired. Generally the ear gets accustomed to noises that are at first most disturbing. For instance, an individual who comes from a quiet neighborhood to live on a street car line, can not sleep at first owing to the disturbing effect of the passing cars and the noise of motors. Soon, however, these noises cease to interfere with his sleep, indicating that a tolerance is established which is peculiar to the individual and which helps him accommodate himself to circumstances.

"Likewise, the individual who has lived in a noisy district and who takes up his abode in a comparatively quiet neighborhood, suffers at first from insomnia or lack of sleep, because of the absence of the noises to which his hearing is accustomed. It is well that we are able to accommodate ourselves in this way, *because much of the noise in a large city must be endured*, though there is no reasonable excuse for noises that can be avoided by proper means.

"While people can and do get accustomed to those noises which are a part of their daily lives, unusual and unnecessary noises tend to upset people's nerves and cause serious annoyance. Of this class of noises, Chicago has its full share, due largely to a lack of cooperation on the part of noise-making agencies. Such noise produces extreme fatigue and is responsible for bad temper, nervous irritability, a slowing up of mental processes and an inability to fix the attention.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

"EFFECT OF NOISE ON HEARING

"The ear is one of the most complex structures of the human body. By its means the sound waves of the air are collected, converted into specialized nerve impulses, and transmitted through the auditory nerve to the brain. Disagreeable noises, excessively loud or shrill, produce overstimulation of the nerves and hearing centers of the brain, which may lead to permanent deafness. The deafening uproar in boiler rooms, factories, and mills has a most deadening effect upon the mechanism of hearing, and riveters and boiler makers often lose their hearing as a result. The constant din may also affect the brain in such a way as to cause giddiness, dizziness, and nausea.

"EFFECT OF NOISE ON SLEEP AND REST

"Without question noise is the greatest enemy of sleep and rest. Sleep is an efficient restorative of wasted energy and a renewer of strength, but to be effective it requires relaxation of nervous tension. If restoration by sleep does not equal waste, the result is physical and mental decay. *Any disturbance leading to loss of necessary sleep is infallibly destructive to the mind and body.*

"In a large city like Chicago, there are many night workers who must sleep during the daytime. All unusual noises prevent these workers from enjoying their sleep or rest in perfect quiet, and even though they are not disturbed enough to be awakened, every noise that is registered in the brain reflects itself in impairment of sleep and rest. The result is that such individuals do not get the proper amount of rest and consequently they may break down prematurely and are unable to compete in their daily labor with those who have the necessary amount of sleep.

"There are also patients in hospitals who are deserving of consideration, many of whose lives depend upon absolute quiet. Lack of refreshing sleep determines the life and death of some individuals affected with certain diseases. One may easily imagine the effect upon a sick patient of a sudden blast from a locomotive whistle or the screeching of a siren or the uproar of loose iron bars in a noisy truck or the staccato of an automobile cut-out, all of which are unnecessary and easily avoidable.

"In the Nation's Health of November, 1921, the subject of needless noise is well summed up as follows:

"'The real psychological explanation lies in the knowledge of the utter uselessness of most of our city noises. Noise spells wasted power. It is a remnant of barbarism made more effective by invention. What is the need for gongs in a world where everybody has a timepiece and most of our activities run on a schedule like a railway? The men of the A. E. F. learned from the tiny whistles of the

Digitized by Google Original from UNIVERSITY OF MICHIGAN

French locomotives how unnecessary is the present bellowing of the prairie whistle which tears across the silence of growing corn and starts the drowsy rustic to his milking. The muffler which can't be cut out has come to stay, while nothing short of extermination will silence the cracked soprano, the raucous junk collector, the cheerful idiot who plays one-finger piano solos. May blessing be upon the head of the health officer who will recognize and treat unnecessary and avoidable noises as a nuisance and menace to the public health. And this is logical, for surely an offense to the ear is quite as bad as offense to the eye or nostrils—perhaps it may be more harmful—and surely the one should be as punishable as the other. The blessed contentment of the quiet of the open fields is not imaginary, it is the sigh of relief from the nerves too taut from the stentorian voices of the city and while the silence may be occasionally broken by the tinny cacaphony of the senile vehicle, the sound-tortured soul is soon assuaged by nature's silence.'

"The commissioner of health calls upon all citizens of Chicago to cooperate with him in his campaign against unnecessary noise for the sake of maintaining health and preventing disease by this preventable cause. He requests that all complaints be made to the health department so that proper action may be taken. He calls, too, upon complainants to follow up the cases with him, so that justice may be done. In taking this action he is mindful of the sick in the hospitals, the infant to whom sleep is so necessary, the night worker who must sleep in the daytime, and the citizens in general who become ill or are annoyed by the constant din of unnecessary noise. He has in mind, too, its effect upon the efficiency of the workers of a large city. He hopes that by securing the cooperation of all the citizens he can reduce to a minimum the nonessential noise and thus help to make the city of Chicago a more healthful and desirable place in which to live."

NOTES FROM NAVAL TRAINING STATIONS

United States Naval Training Station, Newport, R. I.

Cerebrospinal meningitis occurred at this station on December 1, 1923, in a case that has been made the subject of a special report. Routine quarantine and preventive measures resulted in the detection of seven meningococcus carriers. All were transferred to the hospital for treatment. This case of meningitis resulted in recovery and return to duty. All carriers were returned to duty after three successive negative examinations for the presence of the meningococcus.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

The practice of examining all incoming recruits for meningococcus carriers is continued as a routine procedure. No case has occurred since this practice was instituted December 1, 1923, and no carriers have been detected.

The weather has been unusually mild for this latitude. Extremely cold weather has been of rare occurrence and there has been no heavy snowfall during the entire winter. These conditions have been favorable for out-of-doors drills and have mitigated against undue occurrence of respiratory diseases. Tonsillitis, pharyngitis, bronchitis, and laryngitis have occurred much less frequently this year than heretofore, and the average number of men under treatment at the naval hospital is about one-half the number under treatment at the same period last year.

Communicable disease in February was limited to three sporadic cases of German measles. No case of diphtheria occurred and no carriers of diphtheria bacilli were detected.

Owing to the inactivity of the recruiting stations, few recruits were received during the first half of the month. With the resumption of recruiting activity in accordance with Bureau of Navigation's memorandum for the recruiting service dated January 10, 1924, the normal inflow of recruits began again during the latter part of the month. The provisions of the order quoted above were such as to lead to the expectation that, by the selective measures enjoined combined with careful examination, a marked improvement in the average of mental and physical qualities would be found to result therefrom. The results, thus far, have not proved entirely satisfactory from the training-station viewpoint. While a general average improvement in the quality of recruits has been noted, in several instances enlistments were made of men that presented striking examples of defective mental and physical conditions and constituted improper enlistments.

Recruits were received as follows:

Number of recruits manifestly desirable	287
Number of recruits relatively undesirable	7
Number of recruits physically unfit	6
Total	300

The physical conditions of those classes as relatively undesirable were as follows:

1 recruit with tachycardia.
1 recruit with underheight.
1 recruit with underweight.
3 recruits with scabies.
1 recruit with trichophytosis corpora.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The defects of those classed as physically unfit are here appended:

1 recruit with chronic endocarditis. Enlargement of heart, dyspnoea on exertion and murmur heard at base.

1 recruit with goiter. The condition was well marked and easily apparent on inspection.

1 recruit with atrophy of trapezius muscle, right. The condition was well marked with considerable resulting shoulder drop and was readily apparent to inspection. A scar on the neck suggests strongly that the condition was due to nerve severing during a former operation for abscess of neck.

1 recruit with undescended testes. Both testicles undescended.

1 recruit with absence of greater part of right pectoralis major muscle. This was a case of congenital lack of development and was easily apparent to inspection.

1 recruit with partial paralysis, fingers of left hand. Has complete loss of extension of four fingers due to old tendon injury the scar of which is present on back of left wrist. finger-drop is present and is a prominent symptom to inspection.

The above six recruits are described in more or less detail as they are considered to be improper enlistments and are subjects for inaptitude discharges.

During February, 435 recruits were transferred after the completion of training. From the records of weights taken upon the day of arrival and the day of transfer an average gain of weight of 5 pounds per man was found to have occurred. Three hundred and eighty-four men showed actual gains in weight, the average per man being 6 pounds. Fifty-one recruits actually lost weight, the average loss per man being 4 pounds. In the cases of 12 of these men there was an average loss in weight of 5 pounds which was definitely found to be due to physiological causes. Deducting these men and their losses in weight from the total number of men that actually lost weight would give the average loss in weight of 39 men to be 3 pounds. The greatest individual gain in weight was 20 pounds. The greatest individual loss in weight was 15 pounds (physiological reduction of fat).

United States Naval Training Station, Great Lakes, Ill.

A few sporadic cases of measles and scarlet fever continue to occur, but no more than are to be expected from conditions in surrounding communities. One case of mumps occurred in February in a man recently transferred from the fleet after he had been on the station

Digitized by Google Original from UNIVERSITY OF MICHIGAN

five days. Prompt detection and isolation prevented the occurrence of any further cases. Only three cases of venereal disease developed during the month, all three patients being deserters. There were no cases among detentioners or men attached to the main station.

United States Naval Training Station, Hampton Roads, Va.

Sanitary conditions on the training station have been on the whole satisfactory for the month of February. There were 13 cases of measles and 52 of mumps admitted and transferred to hospital. The measles is a continuation of a mild epidemic which began on the station last November and is gradually dying out, the peak having been reached early in January. As the number to become infected with this disease gradually decreases the symptoms also become mild so that it is difficult at times to diagnose and positively determine if a case is mild measles or German measles. This fact is rather interesting to note and probably is due to attenuation of virulence or that those attacked toward the end of an epidemic have a relative natural resistance, or both. Mumps has been most annoying and the cases have occurred in recruits after finishing their period of detention. The infection has been acquired in Norfolk while on liberty. In order to avoid the introduction of mumps in the fleet through drafts from this station a quarantine was established and will not be removed until all drafts for the fleet have departed. One case of smallpox was discovered in a recruit enlisted in Louisville, Ky. He had been on the station but five days before symptoms developed. The symptoms were greatly modified by previous vaccination 13 years ago and the more recent inoculation at the recruiting station. As all recruits in the detention unit had already been vaccinated it was only necessary to revaccinate the "ship's company," officers, chief petty officers, hospital corpsmen, etc. No further cases have developed to date.

The rate of admissions for venereal diseases is gradually declining but the reduction has not been marked. Investigation of each new case indicated that in about 75 per cent infection followed failure to use the tube at all or improperly. In order that the tube may be available for men on liberty and who have failed to obtain one when going on liberty, a supply has been placed in police headquarters and the Navy Young Men's Christian Association. Unfortunately, the secretary of the latter place received instructions from Young Men's Christian Association headquarters forbidding this.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Laboratory examinations for the detection of intestinal parasites in the case of recruits from Southern States were made during February as follows:

State	Examinations	Hookworm	Ascaris	Hymenolepis nana
Maryland	8	0	0	0
West Virginia	6	0	0	0
Virginia	4	0	0	0
North Carolina	11	5	1	0
South Carolina	8	6	0	0
Florida	2	1	0	0
Arkansas	3	0	0	0
Oklahoma	1	0	0	0
Alabama	7	6	0	0
Kentucky	11	3	0	2
Georgia	7	2	0	0
Tennessee	6	2	0	0
Total	74	25	1	2

United States Naval Training Station, San Diego, Calif.

The measles epidemic reached its peak about the middle of January and subsided during the latter part of that month, the last case occurring January 31. There were no admissions for measles in February. Acute tonsillitis and other respiratory diseases including influenza cases of moderate severity were of frequent occurrence. Delay in the installation of steam chambers for the sterilization of mess gear is believed to be responsible for some of the many cases of influenza and tonsillitis.

Of the 422 recruits received during January, 27, or 6.4 per cent, had disabilities for which they should have been rejected upon examination for enlistment, and for which transfer to hospital was deemed advisable. During February, 186 recruits were received, and of these, 16, or 8.6 per cent, had disqualifying disabilities.

The figures for the various recruiting offices concerned, with regard to recruits received and judged unfit during January and February, are as follows:

Recruiting station	Number of men received	Transferred to hospital	Percentage
St. Louis	58	8	13. 79
Seattle	63	7	11. 11
Omaha	27	3	11. 11
Dallas	44	4	9. 09
Houston	25	2	8. 00
Kansas City	85	6	7. 06
Denver	29	2	6. 90
Portland	33	2	6. 06
Los Angeles	101	6	5. 94
San Francisco	71	2	2. 82
Salt Lake City	38	1	2. 63
New Orleans	34	0	0
Total	608	43	7. 07

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

During the first two months of the year 485 laboratory examinations were made for the detection of intestinal parasites in recruits from Southern States. In 22 instances hookworm infection was recognized and in 3, hymenolepis nana. The infected recruits came from the following States:

State	Hookworm	Hymenolepis nana	State	Hookworm	Hymenolepis nana
Mississippi	6	0	Tennessee	1	0
Texas	4	0	Georgia	1	0
Alabama	2	0	Missouri	0	1
Oklahoma	2	1	Louisiana	1	0
Kansas	2	1	Virginia	1	0
Florida	2	0			

REPORT ON VENEREAL-DISEASE CONDITIONS FROM THE U. S. S. "PITTSBURGH"

During the calendar year 1923, there have developed among men attached to the *Pittsburgh* 277 cases of venereal disease, as follows:

Chancroidal infections	90
Gonococcus infections	156
Syphilis	31

In addition to the above, there were under treatment on January 1, 1923, 37 cases of syphilis; during the year 34 cases of syphilis have been received from other vessels, and 26 cases were transferred to other ships. This leaves a total of 76 cases of syphilis under treatment on January 1, 1924. Taking into consideration the conditions under which this ship operates, the above is not an alarmingly high rate, if the figures are compared with other vessels that have performed this duty, or vessels performing similar duties.

All possible means and measures have been taken to prevent exposure, to instruct men as to the early application of preventive treatment, immediate reporting of disease when contracted, and a strict observance of all instructions while undergoing treatment. Seventy-one cases of syphilis, active and nonactive, and 86 cases of other active venereal diseases, chancroid and gonorrhea, the latter requiring treatment two to three times each day over a period of six weeks to two months, are at present under treatment. This makes a total of 157 men, practically none of whom are carried on the sick list, actually under treatment at all times, requiring much time, operative work, and laboratory technique in order to properly carry out the treatment. This number is in addition to the men carried on the sick list for usual causes, and those men reporting to sick call daily (20 to 46) for consultation and treatment.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

It is well known that the ravaging effects of syphilis on the human system, if diagnosed from the primary lesion and immediate treatment instituted, will be prevented in large measure. This will also permit of a cure in the shortest time, with the least manifestation of symptoms, reduce the number of sick days to nil, and reserve to the patient his entire pay, which would otherwise be totally lost to him for the time actually on the sick list. But in order to do this, much skill and time is required by the medical officer; it having been found that for each diagnosis of syphilis made from the primary lesion an expenditure of 20 hours of actual microscopic work was necessary. The following for comparison has been taken from the records, but does not include those cases where only negative results were obtained after many hours of microscopical work:

MEN IN WHOM A DIAGNOSIS OF SYPHILIS WAS NOT MADE FROM THE PRIMARY LESION BUT WHO DEVELOPED CONSTITUTIONAL SYMPTOMS

Case	Rating	Days on the sick list
1	M. att., 1c	27
2	Yeo., 2c	48
3	F., 1c	83
4	G. M., 1c	35
5	Pvt. M	15
6	Sea., 1c	11
Total		214
Average number of sick days per man		36

MEN IN WHOM A DIAGNOSIS OF SYPHILIS WAS MADE FROM THE PRIMARY LESION AND TREATMENT INSTITUTED IMMEDIATELY

7	Sea., 1c	0
8	Sea., 2c	0
9	Mus., 1c	0
10	Sea., 1c	0

Each of these diagnoses required an average of 20 hours' microscopical work.

Results.—No days on the sick list, no loss of pay, no constitutional symptoms, no loss of health, and greatly lessened danger of later symptoms. This work, in addition to other special work, is constantly being carried on, but it has only been possible to do this since the reporting of an additional medical officer.

Space has recently been set aside and a laboratory installed, in which all of this work can be accomplished efficiently, and it is planned, hereafter, to do Wassermann blood tests on board ship for all patients, thereby saving Government funds. Since arriving in European waters this laboratory work, having been done at hospitals ashore, has cost $521.26. Had facilities been available when needed,

Digitized by Google Original from UNIVERSITY OF MICHIGAN

much more would have been done. These tests are additional to tests performed gratis by naval hospitals at Ferryville, Algeria, and Chatham, England, and army medical authorities at Copenhagen. Under the present plan all work will be done on board ship.

FATAL ACCIDENT ATTRIBUTED TO RUSTY SURFACE OF A REVOLVING SHAFT

The added danger to life and limb incurred in working around a revolving shaft when its surface is rusty and roughened, is brought to the attention of commandants and commanding officers of navy yards and naval stations in a letter from the Assistant Secretary of the Navy (Navy Yard Division), citing the case of an employee who was killed March 3, 1924, in the power plant of one of the shore establishments of the Navy.

The circumstances were as follows:

A machinist endeavored to tighten a loose set screw on the damper rod of a blower fan which was located about 7 inches above the shaft revolving at twelve to fourteen hundred revolutions per minute. The shaft was about 8 feet from the floor and apparently the employee had stood upon the blower foundation and reached up over the shaft to get at the set screw. In some manner, his sleeve caught on the revolving shaft, roughened by rust, and his right arm was torn completely from the shoulder. All clothes, except shoes and socks, also were stripped from his body, and with the arm, were tightly wound around the shaft, the body being thrown to the floor. Death followed within two hours.

ADMISSIONS FOR INJURIES AND POISONINGS, JANUARY AND FEBRUARY, 1924

Form F cards received in the bureau between January 1 and February 29 notified injuries and poisonings as follows:

	Within command		Leave, liberty, or absent without leave	Total
	Connected with actual performance of work or prescribed duty	Not connected with actual work or prescribed duty		
Injuries	375	177	86	638
Poisonings	0	3	3	6
Total	375	180	89	644

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Of these admissions, 86.2 per cent were for injuries or poisonings occurring within the command, and 13.8 per cent for cases incurred while on leave or liberty.

Of these cases incurred within naval commands, 67.6 per cent were connected with the actual performance of prescribed work or duty, and 32.4 per cent were not so connected. Of the total admissions for injuries and poisonings only 58.2 per cent were connected with the actual performance of work or prescribed duties; i. e., the result of true naval industrial hazards. The remainder were incidental to liberty, athletics ashore or afloat, skylarking, quarreling, falls other than those connected with work, etc. Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addication" or "Alcoholism," as the case may be. Such cases are not included in the above figures.

The following cases are worthy of notice from the standpoint of accident prevention:

Sprained ankle.—Two cases caused by slipping on a loose plank of a board walk within a naval station.

Steel splinter in the eye.—Failure to wear protective glasses while filing steel.

Punctured wound of the chest (fatal).—Accidental explosion in a supposedly empty rifle while it was being cleaned. Reported as negligence on the part of the injured man.

Lacerated wound of the forehead.—The victim was sleeping beneath a ladder. The line by which the ladder was made fast to the deck above had been partially cut. It carried away and the ladder fell.

Multiple wounds of the scalp.—The injured man was found in the engine-room bilge an hour after checking in from liberty. He had fallen through an open and unguarded hatch. There was no evidence of intoxication. There were no witnesses.

Fracture of femur.—A cleaning stage rigged in dry dock carried away and the man fell into the dock. Invalided from the service after 227 sick days.

Lacerated wound of the hand.—Caused by radio-propeller blade; lack of safety device reported.

Burn of forearm.—Caused by unprotected steam pipe.

Drowning.—Gasoline which had collected in the bilges of a motor boat was ignited by back fire through the carburetor. The deceased feared the gas tank would explode. He jumped overboard and drowned before aid could reach him.

Avulsion of finger.—Caused by shell tongs. Reported as faulty design of equipment.

Digitized by Google Original from UNIVERSITY OF MICHIGAN

Crush of entire body (fatal).—Caused by falling hatch. Reported as inadequate protection by existing safety device.

Fracture of the jaw.—Occurred at a naval station. The victim deviated from a path on account of darkness. He fell over an embankment, striking on a water conduit. There was no guard rail. Reported as lack of safety device.

Burns of the hands.—Three instances of burning by strong solution of lye used in scrubbing paintwork.

Dislocation, cartilage of the knee joint.—Caused by stepping on a loose plank in a board walk at a naval station.

Lacerated wound of the scalp.—Caused by falling down a ladder. The safety lights were out and there was no safety device around the hatchway.

HEALTH OF THE NAVY.

This report is for the month of April. Health conditions have been excellent throughout the winter and spring. The general admission rate for all causes, 741 per 1,000 per year, was considerably higher than the median rate for April based on experience of the preceding five years. The increase above the expected rate was largely due to admissions for venereal disease. The venereal disease rate remained low for personnel on duty ashore in the United States, but sharp increases occurred in the numbers of cases reported from foreign stations and from ships of the fleet, especially ships of the battle fleet, following visits to New York and other ports on the Atlantic coast. The serious damage caused by these diseases is accentuated by the fact that this recent and limited increase was sufficient to raise the general morbidity rate of the entire Navy to a point higher than the median rate for five years, in spite of unusually good health conditions in recent months. That is, conditions were good so far as the common respiratory diseases are concerned, and, as a rule, these largely determine the magnitude of the all-cause rate in spring months.

With the exception of mumps, which has become somewhat more prevalent in recent weeks, admission rates for communicable diseases continue low. From the United States fleet, 89 cases of mumps were reported and 69 cases occurred during the month at shore stations in the United States. Of the latter, 40 were reported by the naval training station, Hampton Roads, Va. The remaining cases were scattered.

Five cases of cerebrospinal fever occurred at the United States Naval Academy; one in the last week of March and four in April. Three of the men attacked were mess attendants and two were midshipmen. There was no apparent connection between cases. It is probable that carriers of the meningococcus at large in Annapolis or

Digitized by Google Original from UNIVERSITY OF MICHIGAN

in the Naval Academy or in both population groups increased in numbers as a result of undetermined causes leading to the separate development of these cases.

The following table shows rates per 1,000 per annum for the principal communicable diseases, April, 1924. For comparison, corresponding median rates are given for the same month, years 1919 to 1923, inclusive:

	April, 1919–1923	April, 1924
Cerebrospinal fever	0	0.41
Diphtheria	1.51	.41
German measles	.60	2.85
Influenza	35.55	26.14
Malaria	13.30	7.02
Measles	4.61	3.15
Mumps	20.58	29.80
Pneumonia	5.04	5.80
Scarlet fever	2.64	2.14
Smallpox	.20	.10
Tuberculosis	4.07	2.34
Typhoid fever	.08	0

VITAL STATISTICS

The Monthly Health Index, which is published on the 15th of each month, contains the statistical data for individual ships and shore stations. The statistics appearing in this BULLETIN are summaries compiled from those published in the Monthly Health Index.

Annual rates, shown in the succeeding statistical table, are obtained as follows:

The total number of admissions to the sick list or the number of deaths reported during the period indicated is multiplied by $\frac{365}{28}$ or $\frac{365}{35}$, or 12, depending upon whether the period includes four or five weeks or a calendar month. The product is then multiplied by 1,000 and divided by the average complement.

E. R. STITT.

TABLE No. 1.—*Monthly report of morbidity in the United States Navy and Marine Corps for the month of April, 1924*

	Forces afloat	Forces ashore	Entire Navy	Marine Corps
Average strength	78,363	39,510	117,973	20,813
All causes:				
Number of admissions	4,437	2,850	7,287	1,092
Annual rate per 1,000	679.44	865.60	741.16	682.06
Disease only:				
Number of admissions	4,060	2,591	6,651	1,213
Annual rate per 1,000	621.71	786.94	676.47	606.48
Communicable diseases, exclusive of venereal disease:				
Number of admissions	1,354	933	2,287	309
Annual rate per 1,000	207.34	283.37	222.61	193.00
Venereal disease:				
Number of admissions	1,544	363	1,907	205
Annual rate per 1,000	236.43	110.25	193.96	128.04
Injuries:				
Number of admissions	367	252	619	117
Annual rate per 1,000	56.20	76.54	62.96	73.08
Poisons:				
Number of admissions	10	7	17	3
Annual rate per 1,000	1.53	2.13	1.73	1.87

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 2.—*Number of admissions reported by Form F cards for certain diseases for the month of April, 1924*

	Forces afloat, Navy and Marines (strength, 78,363)		Forces ashore, Navy and Marines (strength, 39,510)		Total (strength 117,973).	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Diseases	4,060	621.71	2,591	786.94	6,651	676.47
Injuries	367	56.20	252	76.54	619	62.96
Poisons	10	1.53	7	2.13	17	1.73
Total admissions	4,437	679.44	2,850	865.60	7,287	741.16
Class II:						
Varicocele	5	.77	11	3.34	16	1.63
Class III.						
Appendicitis, acute	46	7.04	42	12.76	88	8.95
Autointoxication, intestinal	5	.77	9	2.73	14	1.42
Cholangitis, acute	28	4.29	6	1.82	34	3.46
Cholelithiasis	1	.15	0	0.00	1	.10
Cholecystitis, acute	3	.46	3	.91	6	.61
Colitis, acute	4	.61	0	0.00	4	.41
Constipation	14	2.14	14	4.25	28	2.85
Enteritis, acute	32	4.90	24	7.29	56	5.70
Gastritis, acute catarrhal	21	3.22	15	4.56	36	3.66
Gastroenteritis	29	4.44	19	5.77	48	4.88
Hemorrhoids	27	4.13	23	6.99	50	5.09
Ulcer of duodenum	2	.31	3	.91	5	.51
Ulcer of stomach	1	.15	1	.30	2	.20
Ulcer of mouth	0	0	1	.30	1	.10
Total	213	32.62	160	48.50	373	37.94
Class V:						
Laryngitis, acute	4	.61	8	2.43	12	1.22
Pharyngitis, acute	31	4.75	32	9.72	63	6.41
Rhinitis, acute	8	1.23	8	2.43	16	1.63
Total	43	6.58	48	14.58	91	9.26
Class VIII(A):						
Cerebrospinal fever	0	0	4	1.21	4	.41
Chicken pox	8	1.23	11	3.34	19	1.93
Diphtheria	3	.46	1	.30	4	.41
German measles	16	2.45	12	3.64	28	2.85
Influenza	141	21.59	116	35.23	257	26.14
Measles	19	2.91	12	3.64	31	3.15
Mumps	193	29.55	100	30.37	293	29.80
Pneumonia, broncho	6	.92	15	4.56	21	2.14
Pneumonia, lobar	20	3.06	16	4.86	36	3.66
Scarlet fever	7	1.07	14	4.25	21	2.14
Smallpox	1	.15	0	0	1	.10
Total	414	63.40	301	91.42	715	72.72
Class VIII(B):						
Angina, Vincent's	19	2.91	58	17.62	77	7.83
Bronchitis, acute	226	34.61	141	42.82	367	37.33
Catarrhal fever	131	20.06	84	25.51	215	21.87
Tonsillitis, acute	493	75.49	272	82.61	765	77.81
Total	869	133.07	555	168.56	1,424	144.84
Class IX:						
Dysentery, bacillary	1	.15	5	1.52	6	.61
Dysentery, entamebic	0	0	1	.30	1	.10
Total	1	.15	6	1.82	7	.7
Class X:						
Dengue	29	4.44	18	5.47	47	4.78
Filariasis	0	0	1	.30	1	.10
Malaria	30	4.59	39	11.85	69	7.02
Relapsing fever	1	.15	0	0	1	.10
Total	60	9.19	58	17.62	118	12.00
Class XI:						
Tuberculosis, (all forms)	10	1.53	13	3.95	23	2.34

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 2.—*Number of admissions reported, etc.*—Continued

	Forces afloat, Navy and Marines (strength, 78,363)		Forces ashore, Navy and Marines (strength, 39,510)		Total (strength 117,973)	
	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Class XII:						
Chancroid	641	98.16	102	30.98	743	75.57
Gonococcus infection	814	124.65	194	58.92	1,008	102.52
Syphilis	89	13.63	67	20.35	156	15.87
Total	1,544	236.43	363	110.25	1,907	193.96
Class XVIII:						
Pleurisy, acute fibrinous	12	1.84	9	2.74	21	2.14
Class XX:						
Herniæ	32	4.90	21	6.37	53	.39

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for March, 1924, and from various shore stations for the four-week period April 6, 1924, to May 3, 1924*

	Annual rate per 1,000, March, 1924			Average rate since Jan. 1, 1924		
	Minimum rate	Mean rate	Maximum rate	Minimum rate	Mean rate	Maximum rate
All ships	0	266.90	2,578.51	0	193.50	1,361.34
Battleship divisions:						
Battle fleet	26.09	131.10	501.74	53.00	125.80	326.25
Scouting fleet	27.50	108.79	157.65	92.33	160.59	303.32
Asiatic Fleet [1]	0	464.72	727.27	0	445.17	670.05
Destroyer squadrons:						
Battle fleet	0	306.09	872.73	0	142.85	343.84
Scouting fleet	0	536.57	1,600.00	0	252.68	605.34
Asiatic Fleet [1]	0	366.08	1,868.85	0	353.22	1,241.38
Miscellaneous: [2]						
Battle fleet	0	351.52	1,220.34	0	203.69	447.20
Scouting fleet	0	444.37	1,333.33	0	228.47	697.67
Asiatic Fleet [1]	0	469.41	2,578.51	0	388.66	1,361.34
Naval forces, Europe	0	300.46	897.20	0	247.28	967.74
Special service squadron (based on Panama)	27.46	177.09	263.01	123.71	148.50	283.29
Naval transportation service	0	181.64	500.00	38.12	181.02	466.86
Special duty	0	244.07	736.20	0	208.64	447.08
Miscellaneous and district vessels	0	260.87	571.43	0	197.65	720.00

	Annual rate per 1,000, Apr. 6 to May 3, 1924			Average rate since Jan. 1, 1924		
	Minimum rate	Mean rate	Maximum rate	Minimum rate	Mean rate	Maximum rate
All naval districts in the United States	0	57.51	214.29	0	64.91	224.16
First naval district	0	48.66	87.84	31.96	43.42	122.59
Third naval district	0	40.75	58.82	9.46	44.75	56.74
Fourth naval district	40.06	57.65	73.86	23.27	51.74	78.37
Fifth naval district	0	71.96	149.43	0	74.69	138.49
Sixth naval district	36.43	48.83	214.29	54.43	70.86	224.16
Seventh naval district	0	0	0	0	0	0
Eighth naval district	0	40.63	46.48	24.79	44.25	47.09
Ninth naval district	81.19	81.19	81.19	82.86	82.86	82.86
Eleventh naval district	47.51	66.18	92.20	45.30	67.21	86.27
Twelfth naval district	0	8.78	11.82	38.61	67.29	133.26
Thirteenth naval district	0	39.39	47.02	49.38	105.05	218.00

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 3.—*Summary of annual admission rates for venereal diseases reported from ships for March, 1924, and from various shore stations for the four-week period April 6, 1924, to May 3, 1924*—Continued

RATIO OF GONOCOCCUS AND SYPHILIS INFECTION TO TOTAL CASES OF VENEREAL DISEASES

	Per cent, March, 1924		Per cent since Jan. 1, 1924	
	Gonococcus	Syphilis	Gonococcus	Syphilis
All ships	60.11	4.37	64.60	7.21
Battleship divisions:				
Battle fleet	79.12	9.34	78.24	10.58
Scouting fleet	59.32	10.17	77.95	4.18
Asiatic Fleet [1]	46.67	15.55	49.56	12.39
Destroyer squadrons:				
Battle fleet	64.08	1.41	68.34	4.52
Scouting fleet	55.43	0.54	60.15	2.68
Asiatic Fleet [1]	59.74	5.19	62.16	7.43
Miscellaneous: [2]				
Battle fleet	60.48	1.20	64.87	5.73
Scouting fleet	52.97	3.20	59.62	5.08
Asiatic Fleet [1]	40.00	4.00	42.50	8.33
Naval forces, Europe	67.80	1.69	44.09	5.38
Special service squadron (based on Panama)	61.90	0.0	70.21	6.38
Naval transportation service	59.57	0.0	58.39	8.72
Special duty	62.04	10.18	66.53	8.57
Miscellaneous and district vessels	44.44	0.0	53.57	3.57

	Per cent, Apr. 6 to May 3, 1924		Per cent since Jan. 1, 1924	
	Gonococcus	Syphilis	Gonococcus	Syphilis
All naval districts in the United States	63.87	17.65	74.91	11.48
First naval district	84.62	7.69	68.63	3.92
Third naval district	62.50	37.50	82.86	17.14
Fourth naval district	66.67	33.33	82.61	17.39
Fifth naval district	54.55	18.18	68.44	12.00
Sixth naval district	87.50	0.0	83.67	4.08
Seventh naval district	0.0	0.0	0.0	0.0
Eighth naval district	33.33	33.33	71.43	7.14
Ninth naval district	87.50	12.50	74.29	20.00
Eleventh naval district	71.43	7.14	73.44	9.38
Twelfth naval district	0.0	100.00	77.14	8.57
Thirteenth naval district	33.33	33.33	74.29	20.00

[1] Month of February, 1924.

[2] Vessels of train, base, air squadrons, etc.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TABLE No. 4.—*Number of admissions reported by Form F cards and annual rates per 1,000, entire navy, for the four-week period April 6 to May 3, 1924, inclusive*

	Navy (strength, 97,160)		Marine Corps (strength, 20,813)		Total (strength, 117,973)	
	Number of admissions.	Annual rate per 1,000	Number of admissions	Annual rate per 1,000	Number of admissions	Annual rate per 1,000
Diseases of blood	3	0.40	0	0	3	0.33
Diseases of circulatory system	36	4.82	17	10.62	53	5.84
Diseases of digestive system	337	45.09	89	55.59	426	46.94
Diseases of ductless glands and spleen	5	.67	1	.62	6	.66
Diseases of ear	386	51.64	73	45.60	459	50.58
Diseases of eye and adnexa	47	6.29	13	8.12	60	6.61
Diseases of genito-urinary system (non-venereal)	95	12.71	24	14.99	119	13.11
Communicable diseases transmissible by—						
Oral and nasal discharges (A)	594	79.42	70	43.72	664	73.17
Oral and nasal discharges (B)	1,109	148.37	192	119.92	1,301	143.36
Intestinal discharges	3	.40	4	2.50	7	.77
Insects and other arthropods	60	8.03	41	25.61	101	11.13
Tuberculosis (all forms)	25	3.34	2	1.25	27	2.98
Venereal diseases	1,498	200.42	205	128.04	1,703	187.65
Other diseases of infective type	285	38.13	55	34.35	340	37.46
Diseases of lymphatic system	74	9.90	18	11.24	92	10.14
Diseases of mind	46	6.15	19	11.87	65	7.16
Diseases of motor system	103	13.78	30	18.74	133	14.66
Diseases of nervous system	25	3.34	7	4.37	32	3.53
Diseases of respiratory system	62	8.29	12	7.50	74	8.15
Diseases of skin, hair, and nails	73	9.97	29	18.11	102	11.24
Herniae	42	5.62	6	3.75	48	5.29
Miscellaneous diseases and conditions	118	15.79	47	29.36	165	18.18
Parasites (fungi and certain animal parasites)	81	10.84	12	7.50	93	10.25
Tumors	14	1.87	4	2.50	18	1.94
Injuries	479	64.09	117	73.08	596	65.67
Poisoning	13	1.74	3	1.87	16	1.76
Dental diseases and conditions	20	2.68	2	1.25	22	2.42
Total	5,633	753.64	1,092	682.06	6,725	741.03

TABLE No. 5.—*Deaths reported, entire navy, for the four-week period, April 6 to May 3, 1924, inclusive*

Causes	Navy (strength, 97,160)	Marine Corps (strength, 20,813)	Total (strength, 117,973)
Pneumonia, lobar	3	0	3
Tuberculosis, chronic pulmonary	1	0	1
Syphilis	1	0	1
Malignant growths	1	0	1
Other diseases	6	2	8
Drowning	6	0	6
Other accidents and injuries	7	0	7
Total	25	2	27
Annual death rate per 1,000, all causes	3.34	1.25	2.98
Annual death rate per 1,000, diseases only	1.61	1.25	1.54

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Med.
U.S. Govt
pt.

INDEX TO UNITED STATES NAVAL MEDICAL BULLETIN

VOLUME XX

INDEX TO SUBJECTS

	Page
Accidents, airplane, from the British viewpoint	332
Accidents, aviation	331
Accidents, aviation, and methods of prevention	285
Accident, fatal, attributed to rusty surface of a revolving shaft	811
Accident statistics, injuries and poisonings	666
Adoption of new housing ordinance by the city of San Diego, Calif	274
Advanced tuberculosis unsuccessfully treated by artificial pneumothorax, complicated by pyo-pneumothorax and treatment of thoracoplasty	721
Air ambulance in war	339
Airplane accidents from the British viewpoint	332
Alcoholism and alcohol taxation in Denmark	225
Alcohol taxation and alcoholism in Denmark	225
All-purpose canister gas mask	217
Ambulance, air, in war	339
American College of Surgeons, fellowship in the	354
Anaphylactic reaction from typhoid prophylaxis	475
Anesthesia, general, use of anesthesia for	429
Anesthesia, novocaine	184
Anesthesia, rise of local	445
Ants, eradication of, from ships of the United Fruit Co	520
Appendectomies, notes on 350	7
Appendicitis, acute, within a hernia sac	43
Aviation accidents	331
Aviation accidents and methods of prevention	285
Aviation medicine in France	354
Aviation, ophthalmology in its relation to	347
Avulsion of scrotum, left testicle and sheath of penis	457
Bacillary dysentery among Marine Corps and Navy personnel serving with the gendarmerie of Haiti	800
Bacillary dysentery at the marine barracks, rifle range, Santo Domingo city, Dominican Republic, epidemiological report of an outbreak of	797
Bacillary dysentery in Guam	417, 801
Bacteriological standards for swimming pools in Detroit, supplementary report on tentative	676
Bichloride of mercury poisoning with calcium sulphide as a chemical antitode	572
Bladder, irritable, food allergy as a cause of	72
Book notices	103, 235, 483, 653, 751
Bronchitis, pneumonia, and tonsillitis season: Housing, ventilation, and contact	107
Bubo, climatic	1
Burns, extensive superficial	697
Calcium sulphide as a chemical antidote, bichloride of mercury poisoning with	572
Cancer in St. Croix, Virgin Islands	31

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Page
Carbon tetrachloride, lamblial dysentery treated with 73
Cerebrospinal fever at the United States Naval Training Station, Newport, R. I., report of a case 415
Cerebrospinal fever in the British Army, prevention and control of, as reviewed in the official history of the war 493
Chancre of the palmar surface of the hand 44
Chaulmoogra oil derivatives, report of a death occurring during treatment for leprosy with 594
Chemical and physiological aspects of industrial fatigue, studies by the United States Public Health Service regarding 795
Chemical antidote, bichloride of mercury poisoning with calcium sulphide as a 572
Chest and head injury cases, gas mask for 200
Chronic duodenal ulcer 581
Circular letters 81, 617
Climatic bubo 1
Clinical laboratory to the modern hospital, relation of the 196
Clinical notes 89, 205, 451, 581, 715
Clinical trial of the Ellis test for tuberculosis 17
Comments and notes 53, 213, 331, 468, 597, 727
Communicable diseases among men and animals, some factors which lead to the increase and decline of 128
Communicable diseases, methods used in the prevention and control of, at the Naval Training Station, Hampton Roads, Va 669
Construction of vulcanite partial dentures 578
Contact, housing, and ventilation: Pneumonia, bronchitis, and tonsillitis season 107
Convalescent serum in New York to prevent measles in the children after exposure, use of 517
Cooperating with all departments 234
Correction, a 727
Correct reporting of cases remaining at the end of the calendar year 1923 677
Cowpox vaccinations, medical officer recommends adoption of a register for 412
Cystoscopy and report of three unusual cases 207
Dental radiographs, note on interpretation of 736
Destroyer squadrons of the battle fleet, medical bulletin of the 416
Detection of the psychopath and classification of naval recruits in accordance with their intelligence 149
Diabetes mellitus, insulin treatment of 170
Diathermy in pneumonia 68
Dietetic department to the medical service of a hospital, relation of 477
Dietetics taken at Miss Farmer's School of Cookery, Boston, Mass., notes on 605
Division of Preventive Medicine 107, 247, 395, 493, 659, 795
Dystentery and the tendency to report ill-defined cases under a dysentery title 523
Dysentery, bacillary, among Marine Corps and Navy personnel serving with the gendarmerie of Haiti 800
Dysentery, bacillary, epidemiological report of an outbreak of at the marine barracks, rifle range, Santo Domingo City, Dominican Republic 797
Dysentery, bacillary, in Guam 417, 801
Dysentery, lamblial, treated with carbon tetrachloride 73

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Page
Eighteenth century country practice 467
Electrocardiograph in prognosis, value of 423
Ellis test, clinical trial of for tuberculosis 17
Endocarditis, malignant, following fracture of the ribs 586
Endocrine survey 74
Endothelioma 39
Epidemiological considerations; Swimming pools in Detroit 271
Epidemiology of smallpox and the preventive value of vaccination with cowpox virus, remarks on the 395
Eradication of ants from ships of the United Fruit Co 520
Eradication of vermin 672
Eradication of vermin on board ship 247
Ethylene for general anesthesia, use of 429
Etiology of gout 221
Fatal accident attributed to rusty surface of a revolving shaft 811
Fellowship in the American College of Surgeons 354
Filariasis and Kondoleon operation 715
Fish poisons 466
Follow-up treatment of syphilis 665
Food allergy as a cause of irritable bladder 72
Food handlers in New York City, physical examination of 522
Food poisoning 672
Fracture of the ribs, malignant endocarditis following 586
Gas mask, all-purpose canister 217
Gas mask for head and chest injury cases 200
Gas warfare in the air 341
German hospital ship during the World War 597
Glanders in man 41
Gout, etiology of 221
Hawaiian Islands, leprosy in the 705
Head and chest injury cases, gas masks for 200
Health conditions, comments relating to, from the annual report of the commander of the United States naval detachment in Turkish waters 515
Health of the Navy 143, 278, 418, 524, 678, 813
Health work, practical objectives in 225
Hospital corpsmen, instruction of 357
Hospital ship, German, during the World War 597
Housing ordinance, new, adoption of by the city of San Diego, Calif 274
Housing, ventilation, and contact: Pneumonia, bronchitis, and tonsillitis season 107
Human intestinal parasites in Guam 137
Hydatidiform mole, case of 460
Hydronephrosis 481, 567
Hydrogen sulphide, toxic effect of 519
Improved sanitary quality of foods now marketed compared with conditions 10 years ago, as observed in Detroit 673
Improved technique in spinal puncture 205
Incontinence of urine 591
Industrial fatigue, studies by the United States Public Health Service regarding the chemical and physiological aspects of 795
Injuries and poisonings—accident statistics 666
Injuries and poisonings, admissions for January and February, 1924 811
Instruction of hospital corpsmen 357

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Page

Instructions issued by the Bureau of Medicine and Surgery 81, 617
Additional data required on the Form F card in all cases of injury (290–1923) 95
Addition of diagnostic title number 1973, "Urticaria," to Navy Nomenclature of Diseases and Injuries (305–1924) 630
Administration of triple antityphoid vaccine (301–1924) 627
Adoption of revised Nomenclature of Diseases and Injuries, Medical Department, United States Navy (294–1923) 618
American Red Cross (312–1924) 636
Analysis of the naval hospital ration for 1923 (continental hospitals only) (288–1923) 91
Applicants for appointment in the Navy Nurse Corps, physical examination of 651
Assignment of light duty to hospital patients (310–1924) 635
Care in handling concentrated spirit of nitrous ether (306–1924) 631
Change in the Manual of the Medical Department 652
Classified expenditures and per diem cost in naval hospitals (continental) during October, 1923 (302–1924) 628
Classified expenditures and per diem cost in naval hospitals (continental), during the quarter ending September 30, 1923 (295–1923) 619
Closer relation between medical officers on recruiting duty and the Bureau of Medicine and Surgery 649
Complement fixation tests for syphilis 638
Disciplinary regulations referring to beneficiaries of the United States Veterans' Bureau in naval hospitals (313–1924) 637
Enlistment of men not physically qualified (300–1924) 625
Epidemiological study of influenza, the common cold, and other respiratory disorders, now being carried on by the United States Public Health Service: Request for cooperation by medical officers of the Navy (297–1923) 621
Equalization bill (307–1924) 632
Examination report, Hospital Corps, United States Navy, Form N. M. S. H. C. I. (287–1923) 90
Form F cards in cases of patients taken up as from change of diagnosis (303–1924) 629
Form N. M. S. F. (revised) (284–1923) 84
Form N. M. S. H. C. 3, forwarding of in the case of hospital corpsmen whose records have been closed for desertion and convicted of absence without leave, or absence over leave, or restored to duty (311–1924) 636
Form "X," Abstract of enlistments (304–1924) 630
Hæmostatic forceps and surgical needles carried in stock at the medical supply depots (283–1923) 83
Health records retained in files (291–1923) 100
Hospital accounting (286–1923) 86
Hospital Corps Handbook, United States Navy, 1923, issue of (293–1923) 617
Instrument, plastic filling, Black's, Nos. 1 to 7, addition to Supply Table, Part II (309–1924) 635
Laboratory courses for nurses of the United States Navy (299–1923) 624
Memorandum for medical officers on recruiting duty 650
Modification of present allotment system (308–1924) 633
Paragraphs 1280 and 1281, Naval Courts and Boards, 1923 (296–1923) 620

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Instructions issued by the Bureau of Medicine and Surgery—Continued Page
Patients suffering with tuberculosis or neuropsychiatric diseases and conditions who are veterans of the Spanish-American War, Boxer Rebellion, and the Philippine Insurrection, now under treatment but who are not beneficiaries of the Veterans' Bureau as veterans of the World War, and who are not at present members of the regular Military and Naval Establishments (292–1923) 617
Policy of United States Employees' Compensation Commission regarding employees suffering from occupational diseases; now considered compensable and entitled to treatment (285–1923) 85
Reprints of the bureau's circular letters for office files (289–1923) 94
Schedule of wages for civilian employees, effective January 1, 1924 (298–1923) 623
Shortage in petty officer ratings in Hospital Corps (282–1923) 81
Transportation of insane patients 649
Wampole's hypno bromic compound 101
Wampole's hypno bromic compound, analysis requested 101
Instructors of nursing, notes on a course for 363
Insulin treatment of diabetes mellitus 170
Intestinal parasites, human, in Guam 137
Kondoleon operation and filariasis 715
Lamblial dysentery treated with carbon tetrachloride 73
Lancet and Thomas Wakley 66
Leprosy in the Hawaiian Islands 705
Leprosy, report of a death occurring during treatment of with Chaulmoogra-oil derivatives 594
Lighting, operating room 230
Liver, acute yellow atrophy of 49
Local anesthesia, rise of 445
Malignant endocarditis following fracture of the ribs 586
Marine Barracks, Washington, D. C., notes from the 672
Marine Corps East Coast Expeditionary Force, medical department of during the fall maneuvers of 1923 531
Mass immunity to diseases 127
Maxillary sinusitis of dental origin 716
Measles, prophylatic injection of normal serum against 72
Measles, prophylaxis of, review of literature relating to 268
Medical bulletin of the destroyer squadrons of the Battle Fleet 416
Medical Department activities at naval training stations 275
Medical Department of the Marine Corps East Coast Expeditionary Force during the fall maneuvers of 1923 531
Medical Examiners, bulletin of the National Board of 224
Medical expedition to the South Seas 470
Medical officer recommends adoption of a register for cowpox vaccinations 412
Mental tests for recruits 463
Military Surgeons, Association of, meeting of 53
Misconduct ruling 603
Miss Farmer's School of Cookery, Boston, Mass., notes on dietetics taken at 605
Mole, hydatidiform, case of 460
Monasteries, phlebotomy in the 228
National Board of Medical Examiners, bulletin of the 224
Naval training stations, Medical Department activities at 275

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Page
Naval training stations, notes from 804
Navy Nurse Corps 75, 231, 363, 477, 605, 739
Noise, needless, a detriment to health and efficiency 801
Nomenclature titles, remarks relating to the use of 523
Notes and comments 53, 213, 331, 463, 597, 727
Notes, clinical 39, 205, 451, 581, 715
Novocaine anesthesia 184
Nurse Corps, Navy 75, 231, 363, 477, 605, 739
Nursing, instructors of, notes on a course for 363
Nursing in the Philippine Islands 231
Operating-room lighting 230
Ophthalmology in its relation to aviation 347
Parasites, human intestinal, in Guam 137
Pharmacopœia, revision of the 227
Philippine Islands, nursing in the 231
Phlebotomy in the monasteries 228
Physical efficiency, estimation of 335
Physical examination of food handlers in New York City 522
Physicians, two, of Tortola 216
Physiological effects of high temperatures and high relative humidity 674
Physiotherapy, need of 214
Pneumonia, bronchitis, and tonsillitis season: Housing, ventilation, and contact 107
Pneumonia, diathermy in 68
Poison gas, protection of capital ships against 58
Poisonings and injuries, admissions for January and February, 1924 811
Poisoning, food 672
Poisonings and injuries, accident statistics 666
Portable canvas sack steam disinfectors available 417
Prevention and control of communicable diseases at the Naval Training Station, Hampton Roads, Va., methods used in the 669
Preventive Medicine, Division of 107, 247, 395, 493, 659, 759
Prophylactic injection of normal serum against measles 72
Prophylaxis and venereal disease in the United States Asiatic fleet 522
Prophylaxis of measles, review of literature relating to 268
Protection of capital ships against poison gas 58
Psychometric tests in the Navy, value of 213
Psychopath and classification of naval recruits in accordance with their intelligence, detection of 149
Pulmonary affections, value and limitations of Röntgen ray in the diagnosis of 728
Pulmonary tuberculosis, diagnosis of early 685
Pulmonary tuberculosis, early diagnosis and treatment of 691
Pyelography 559
Radiographs, dental, note on interpretation of 736
Recruits, mental tests for 463
Refrigerator, how to use a 473
Relation of the clinical laboratory to the modern hospital 196
Relation of the dietetic department to the medical service of a hospital 477
Remarks relating to the use of nomenclature titles 523
Report of a death occurring during treatment for leprosy with Chaulmoogra-oil derivatives 594
Resuscitation apparatus 659

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Page

Röntgen ray in the diagnosis of pulmonary affections, value and limitations of ---- 728
San Diego, Calif., adoption of new housing ordinance by the city of ---- 274
Sarcoma ---- 451
Sclerodrma, recurrent diffuse ---- 45
Scrotum, left testical and sheath of penis, avulsion of ---- 457
Sheath of penis, scrotum, and left testical, avulsion of ---- 457
Sinusitis of dental origin, maxillary ---- 716
Smallpox and the preventive value of vaccination with cowpox virus, remarks on the epidemiology of ---- 395
Smallpox, vaccination against ---- 355
"Solitary" tuberculous abscess of liver, report of a case of large ---- 719
South Seas, medical expedition to ---- 479
Spermatic cord, traumatic hematoma of ---- 206
Spinal puncture, improved technique in ---- 205
Statistics, accidents, injuries and poisonings ---- 666
Statistics, vital ---- 144, 280, 419, 525, 679, 814
Submarine ventilation in tropical waters, studies of ---- 759
Sugar in urine ---- 35
Sulpharsphenamine, a report on its use at the Mayo Clinic, Rochester, Minn ---- 702
Sulpharsphenamine on board ship ---- 736
Superficial burns, extensive ---- 697
Supplementary report on tentative bacteriological standards for swimming pools in Detroit ---- 676
Swimming pools in Detroit, epidemiological considerations ---- 271
Syphilis, follow-up treatment of ---- 665
Syphilis, new method of treating ---- 229
Syphilis, unsuspected ---- 439
Temperatures, high, physiological effects of and high relative humidity ---- 674
Testicle, left, sheath of penis, scrotum, avulsion of ---- 457
Tonsillitis, pneumonia, and bronchitis season; Housing, ventilation, and contact ---- 107
Tortola, two physicians of ---- 216
Toxic effect of hydrogen sulphide ---- 519
Traumatic hematoma of spermatic cord ---- 206
Tuberculosis, advanced, unsuccessfully treated by artificial pneumothorax, complicated by pyo-pneumothorax and treatment of thoracoplasty ---- 721
Tuberculosis, clinical trial of the Ellis test ---- 17
Tuberculosis, pulmonary, diagnosis of early ---- 685
Tuberculosis, pulmonary, early diagnosis and treatment of ---- 691
Tuberculous abscess of liver, "solitary" report of a case of large ---- 719
Typhoid fever report ---- 523, 672
Typhoid prophylaxis, anaphylactic reaction from ---- 475
Ulcer, chronic duodenal ---- 581
Unsuspected syphilis ---- 439
United States naval detachment in Turkish waters, comments relating to health conditions from the annual report of the commander ---- 515
U. S. S. Detroit, venereal-disease experience of, during her "shakedown" cruise ---- 671
U. S. S. Pittsburgh, venereal-disease conditions from, report on ---- 809
U. S. S. Relief: My first duty aboard ship ---- 739

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

	Page
Urine, incontinence of	591
Urine, sugar in	35
Vaccination against smallpox	355
Vaccination with cowpox virus, remarks on the epidemiology of smallpox and the preventive value of	395
Venereal diseases and prophylaxis in the United States Asiatic Fleet	522
Venereal-disease conditions from the U. S. S. Pittsburgh, report on	809
Venereal-disease experience of the U. S. S. Detroit during her "shake-down" cruise	671
Venereal disease in England, prevention of	140
Ventilation, housing, and contact: Pneumonia, bronchitis, and tonsillitis season	107
Ventilation, submarine, study of in tropical waters	759
Vermin, eradication of	672
Vermin, eradication of on board ship	247
Vital statistics	144, 280, 419, 525, 679, 814
Vulcanite partial dentures, construction of	578
Wakley, Thomas, and the Lancet	66
Yaws in Haiti, observations concerning	190
Yellow atrophy of liver, acute	49

INDEX TO AUTHORS

	Page		Page
Bishop, H. C	460	Marshall, L. B	207
Bloedorn, W. A	423	McCants, J. M	572, 705
Bunker, C. W. O	35	McClintock, G. L	49
Butler, C. S	1	McDaniel, F. L	594
Chambers, W	531	Moots, C. W	429
Choisser, R. M	451	Neuberger, J. F	285
Connor, W. H	439	Owens, W. D	170
Cottle, G. F	184, 457	Pollard, J. B	691
Cuthbertson, R	431	Pugh, W. S	559
Desmond, L. M	578	Raison, T. W	205
Engle, R. B	567	Rathbun, W. L	685
Ferguson, D	17	Roberts, L. J	423
Gutzmer, E. W	721	Robinson, L. F	719
Harris, E. M	591	Root, J. E	44
Hayden, R	702	Satterlee, R. C	41
Howell, E. B	716	Shepard, G. W	697
Ingraham, C. A	445	Smith, O. A	581
Johnson, Lucius W	7	Stearns, A. W	149
Jones, R. F	759	Stenhouse, H. M	715
Kemmerer, T. W	268	Sumerlin, H. S	196
Kress, C. C	460	Summers, B. M	586
LaFavre, H. B	795	Thrasher, R. L	35
Lane, C. W	45	Van Gaasbeek, C. B	31, 43
Lane, F. F	200	Williams, L. H	39, 41, 206
Libby, T	739	Wilson, P. W	190
Mankin, G. H	759		

Digitized by Google
Original from UNIVERSITY OF MICHIGAN